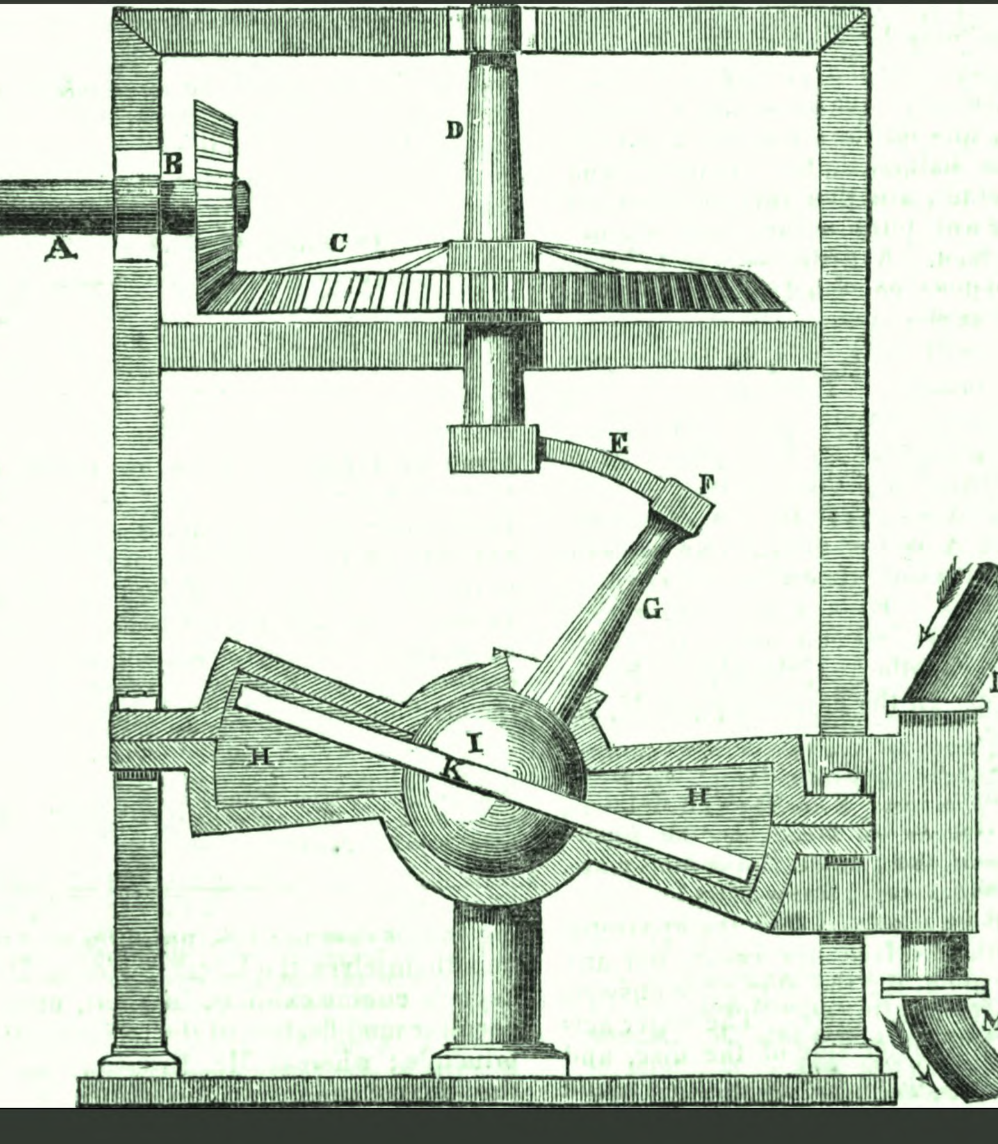

The Mechanics' magazine, museum, register, journal, and ...

Charles Babbage

Lucasian Professor of Mathematics in the University of Cambridge.

Engraved by Roffe, by permission from an original Family Painting.

[illegible] MAGAZINE,

MUSEUM,

Register, Journal,

AND

GAZETTE,

OCTOBER 6, 1832—MARCH 31, 1833.

VOL. XVIII.

1833.

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PREFACE

TO THE

EIGHTEENTH VOLUME.

Full justice is commonly supposed to be done to that cheapness which forms so remarkable a feature of the literature of the present times, when it is allowed to have facilitated amazingly the diffusion of knowledge among all classes of the people. This, however, is to take but a limited view of the good with which it has been attended; for in proportion as the prices of books have been lowered, so also has the public learnt to appreciate the contents of books more according to their real worth. The time is not long gone past, when cheapness in a literary production was generally looked upon as a sure proof of want of respectability, if not of merit. Large paper, large type, large margins, and large prices, were things almost as essential to a good literary reputation as genius and learning themselves. Nobody would publish in little, for fear of being thought little. Even learned Societies deemed that it concerned their dignity to occupy the largest possible space with the least possible quantity of information. It was in ridicule of this foible of the age that a distinguished political writer, and, apart from his politics, one of the greatest living ornaments of English literature, published his "Twopenny Trash;" as if the matter of cheapness could make trash of what was, in other respects, (in the opinion of the author at least) invaluable. A foible more

truly vulgar in its nature never perhaps obtained currency from the influence of fashion. To measure the productions of mind by a foot-rule, or to weigh them against the quantity of gold-leaf on their outer covering, is to assimilate to the very lowest condition of human ignorance. What is it but the influence which printing has had in making knowledge cheap, that has caused it to be regarded as one of the greatest blessings ever conferred on mankind? "The single and very simple operation of Guttenberg's invention," says Sir James Mackintosh, "*in reducing the price of books*, has augmented tenfold the mass of reason employed in human pursuits, and multiplied beyond the possibility of calculation the chances of native genius and wisdom." Was it not, then, taking rather a backward march in improvement to encourage such books only as were dear? What better calculated to banish reason, genius, and wisdom altogether from the world? Happily, it was but a fashion, and, after the manner of all fashions, is fast passing away. Cheapness is now become almost as much the rage, as high prices were some few years ago. The prejudice which made bulk and finery the standards of merit is nearly extinct. The most distinguished scholars of the age may be seen daily stepping forth in drab and duodecimo to instruct and delight their fellow-men; and Societies, patronised by the highest dignitaries of the State, send forth "Penny Magazines," without having any occasion, like Mr. Cobbett, to satirise the spirit of the times by the addition of the word "Trash."

We have been led into this train of reflections by the perusal of a letter which we lately received from one of the most ingenious, though (as usual) one of the least rewarded, Ministers of the Church, in which, speaking of the part which the MECHANICS' MAGAZINE has played in this literary reformation, and of the merits of the present Volume of the work compared with the earlier volumes, he

observes, "I feel impatient to communicate to you the great pleasure I have received from the contrast exhibited by the Magazine as it was and is. Even in its infancy it commanded no small share of interest and respect, as it struggled with the opposition of prejudice and the inertia of that latent and still torpid talent, whose energies its aim was to arouse. But now its place is in the very van of the march of intellect, backed by an array of genius, talent, and learning which, though perhaps not unequalled, is nowhere surpassed. Its pages furnish cheering evidence that the tree of knowledge, so newly planted in the garden of industry, is bearing blossoms and fruit as well as leaves."

Although not disposed to think the contrast between the earlier and the more recent volumes of the Magazine so great as our correspondent represents, (of which, however, it may fairly be thought, we are by no means the most competent judges,) we must freely acknowledge that we did feel we had obstacles to struggle with, in the production of the former, from which the latter have been comparatively free. The "opposition of prejudice" was great —much greater than from even the "inertia" of that talent which it was our fondly cherished object to quicken into full and vigorous action; and this prejudice, when thoroughly sifted, was found to rest on no better basis than that vulgar reverence for high prices, which the good sense of the present times has so nigh demolished. Men—even intelligent men, in all other respects—were slow to believe that any thing good could be published at so cheap a rate; and of the many who thought better of our efforts, and aided them by their contributions, there were few who chose to run the risk of losing caste, by supporting so low-priced a vehicle of information with the credit of their names.

Doubtless, the more recent volumes of the Magazine must have profited largely by the beneficial change which has

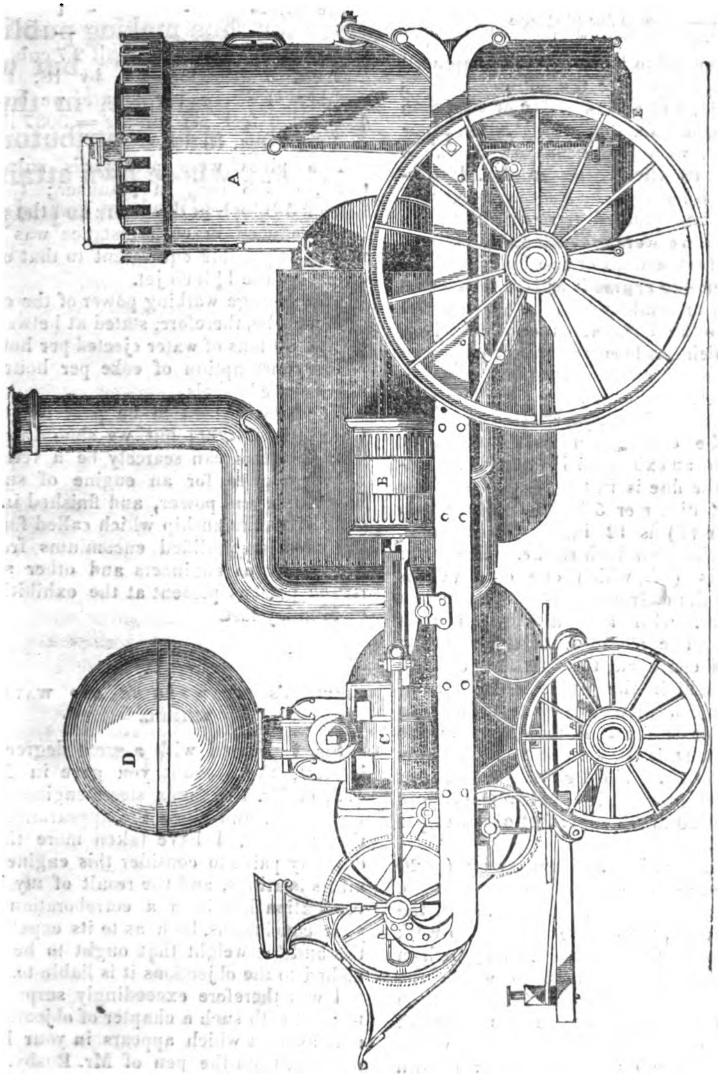
taken place in public opinion on these points. How far the pages of the one which we now dismiss from our hands are of a nature to justify the high encomium passed upon them by our clerical friend, it becomes us not to say. Indeed, were the honour of no other pen than our own concerned, we should take shame to ourselves for thus making public, praise which was not intended for the public ear; but we feel only as if discharging a debt of gratitude, in thus making known to our many kind and able contributors, what is thought of their labours by one whose own attainments in mechanical science eminently qualify him to judge of the attainments of others.

March 31, 1833.

Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 478.] SATURDAY, OCTOBER 6, 1832. [Price 3*d*.



THE STEAM FIRE ENGINE "COMET,"

Constructed for the Prussian Government by Mr. John Braithwaite.

THE STEAM FIRE ENGINE "COMET."

We give on the preceding page an engraving of a new steam fire engine, which, has been built by Mr. Braithwaite for the King of Prussia, and has been named the "Comet," (in honour we presume of the portentous stranger whose near approach is

——— with fear of change
Perplexing monarchs.)

It is intended to be exclusively employed for the protection of the public buildings of Berlin, and will in a day or two, take its departure for that capital. On Monday last, we were present at a public trial of its capabilities at Mr. Braithwaite's Wharf, on the Paddington Canal, and we now proceed to report the results of which we were eye-witnesses.

But, first, a word or two by way of description; the engine it will be seen bears a general resemblance to the one of which we gave an account in our 340th No., and which has been repeatedly employed with so much effect at fires in this metropolis. A. the boiler is on the same plan as that of the Novelty with this exception that the combustion is promoted by means of an exhauster F, instead of a bellows; the flue is in two lengths, and the greatest diameter 5 inches. The steam cylinder (B) is 12 inches in diameter, with a fourteen inch stroke. The water cylinders (of which one only (C) is seen in the engraving), are 10½ inches in diameter, with also a fourteen inch stroke. The steam from the eduction pipe is conveyed through two coils of tubing laid in the water tank, and imparts a considerable degree of heat to the water before it is transferred to the boiler. D. is the air vessel, E. the furnace grating. The feed pump (not seen in the engraving), is equal to the supply of from 20 to 25 cubic feet of water per hour.

The steam having been got up (in 20 minutes, as we were informed) and the pressure in the boiler being at 70 lbs. the square inch, the engine was set to work with a single pipe applied, of 1¼ inch in diameter. The height to which the water was ejected, could not be less than from 115 to 120 feet. The number of strokes per minute was eighteen, which gives for the quantity of water thrown 1 ton 7 cwt. 13 lbs. per minute. For,

The water cylinder being 10½ in diameter, the area of the water piston must be 86.6 square inches;

And a 14-inch stroke of the engine gives for the length of the stroke in the water cylinder 56 inches;

Therefore, $86.6 \times 56 = 4849.6$ cubic inches of water each stroke = 2.8 cub. ft.
Deduct for back water through the valves - - 1

Leaves for the effectual result 2.7 cub. ft.

And, multiplying 2.7 by 18, the number of strokes per minute, we have 48.6 cubic feet per minute = 3037 lbs. = 1 ton 7 cwt. 13 lbs.

Two pipes were afterwards substituted, of 7-8 inch in diameter; then four of 5-8 inch in diameter; and the effects produced in each instance was as nearly as possible equivalent to that obtained by the 1¼ inch jet.

The average working power of the engine may be, therefore, stated at between 80 and 90 tons of water ejected per hour.

The consumption of coke per hour is about three bushels.

The sum agreed to be paid for the Comet, is £1200; but we should imagine that this can scarcely be a remunerating price for an engine of such magnitude and power, and finished in a style of workmanship which called forth the most unqualified encomiums from the numerous engineers and other scientific persons present at the exhibition of Monday last.

ERICSSON'S STEAM-ENGINE AND WATER-WHEEL.

Sir, I perused with a great degree of interest, the account you gave in No. 476, of Mr. Ericsson's steam engine and water mill, and since the appearance of that number, I have taken more than ordinary pains to consider this engine in all its bearings, and the result of my investigation has been a corroboration of your conclusions, both as to its capabilities and the weight that ought to be attached to the objections it is liable to.

I was therefore exceedingly surprised to meet with such a chapter of objections to it as that which appears in your last number, from the pen of Mr. Busby. I consider it due to science as well as to the true merit of the subject, that the

fallacy and unimportance of these objections should be exposed.

1. Mr. Busby first directs attention to the motion of the cone against the oblique plane "with all its grinding." I will therefore begin by estimating the value of his notions on this point. An engine of 3·25 feet diameter will have a cone of 3·07 diameter, difference = 0·18; it is therefore evident that the speed with which the surface of the plane passes over the surface of the cone, will only be as great as that of the circumference of a conical gudgeon 2 inches (0·18) diameters at one end and $\frac{1}{8}$ of an inch, at the other, of a length equal to the side of the cone or 16 inches; therefore instead of the crude notion of "grinding," we see that the motion between the plane and cone will be nothing more than that which takes place between a gudgeon of the stated dimensions and its brass when making an equal number of revolutions with the engine, while the cone and the plane will endure wear 18 times as long as such a gudgeon on account of their larger surfaces. To form an idea of the real unimportance of the friction in diminishing the power, let us suppose that the *plane were not guided by the ball and socket, but suffered* to press against the cone with the force equal to a ton; now the sliding motion is to the speed of the circumference of the plane, as 18 to 325, and friction is generally considered equal to $\frac{1}{8}$ part of the pressure; hence 15$\frac{1}{2}$ lbs applied at the circumference of the plane will balance the "grinding" friction, that is, less than $\frac{1}{100}$th part of the power of the engine would be absorbed for that purpose.

2. Mr. Busby asserts that there are 40,000lbs. at work in separating the cone and the plane! but, as any one bestowing the least attention on the subject can see that steam might find its way behind the cone and plane, to cause any desirable counteraction, this gross mistake may be disposed of without further comment, and, the "powerful disposition to tilt," assigned to the plane, be looked into. For this purpose, suppose the engine in that position where *three* quarters of the surface of the plane are exposed to the pressure of the steam, but instead of 40,000lbs. allow 20,000lbs. as being unbalanced from behind. It is evident that this force will be chiefly exerted towards the end of the pivot, and that the *side pressure* on the ball and socket, will depend on the position of the centre of gravity of the surface exposed and this centre of gravity being situated precisely 3,$\frac{9}{10}$ inches, from the centre of the plane, and 27 inches from the end of the pivot G, it will be found that 2,888 lbs. is the whole side pressure on the ball and socket, (for $\frac{3.9 \times 20000}{27}$ = 2888), which is less than the force with which the crankshaft of a 10 horse steam engine is depressed and lifted up for every stroke of the engine. There would be no reason for apprehension on this head, were this pressure even fourfold; the socket-ball being 7 inches and carried by a shaft of equal diameters. The supposition of the *packings, suffering* by the pressure *on the plane*, needs no refutation, as it assumes the motion, not to be guided by the ball and socket.

3. The packages or segments at the edges of the wings are not "in and out" of contact with the surface of the chamber; for the two ends of the segment *never leave the chamber*, and the middle part of this segment, although being less worn in passing the opening, will naturally in passing between the openings, be corrected, as any reduction at its ends would then cause the middle part *only* to touch the chamber.

4. The "packings AA" (should be VV) *are not* "particularly liable to injury from their constant change of position," on the contrary, that very change of position, causes every part of their edges to be successively in contact with the surface of the wing, and by which, *distributed wear*, is promoted in the same way that the strings of a violin, although not on a level, are equally touched by the *constant change* of the position of the bow during the stroke.

The notion that the packing would be injured by the wing in its urging the plane round, will be best refuted by considering what a small force that requires. The amount of the resistance caused by "all the grinding," we have disposed of before; the resistance caused by the friction of the packing ring, remains therefore to be estimated. The packing is divided into 8 segments, and each is pressed out with a force of 20lbs.; the total pressure of the packing therefore = 160lbs.: one-eighth of which 20lbs. will be their resistance. Considering the size of the ball and the pressure of the socket,

as before computed, it is evident that the motion of the ball will tend to turn the plane round, and this tendency will be about equal to the friction at the end of the pivot, this being steeled as well as working against an alloy'd; the wing will therefore have but little, if any thing to do, in overcoming that friction. It should be also remembered that the pressure of each wing *continues* against that packing *which is before the action*, and which thereby becomes in fact stationary in the plane, and that in an engine made to work only one way, this packing might altogether be dispensed with.

5. It is represented that a "heavy *fly wheel*" is indispensable, although one of the distinguishing features in this engine, is, that the power at no period of its revolution ceases (as does the power of a common steam engine, when the crank passes the centres). The greatest *diminution* of force takes place when the wings are in a horizontal position, when it is reduced to one-half, but as soon as the wing has performed only *one-eighteenth part of its revolution*, the force is augmented to *two-thirds*, and after having gone *one-thirty-sixth* part of a revolution further, it is increased to *three-fourths* of the extreme force. If now, the speed also be taken into account, it will be seen, that the regularity of the motion of the engine, is, in a practical point of view, equal to the regularity of a steam engine with *two* cylinders working right angular cranks; what more is there desirable for *all* locomotive purposes? For stationary engines, requiring great regularity of motion, a fly wheel, so far from being objectionable, is, under all circumstances useful; but the statement that a "heavy' one is required for this engine, is quite fallacious, the mean of the regularity compared to the extreme force, being only as 10 to 12. Supposing therefore 120 revolutions only, a fly wheel less than $\frac{1}{10}$ of the weight of one of an ordinary steam engine, would produce equal regularity. The stated "back-lash," on the pinion is an absurdity; it could only take place were the force of the engine at any time less than the force requisite to keep the same in motion. The ordinary steam engine would be liable to such "back-lash"; for there is a period when the *engine itself* has no other motion than *that* communicated to it *by the fly wheel*.

6. The supposed difficulty of preventing leakage at the angular points, is to be got over about as easily as at the angular points of the wedge pieces of a metallic piston, and which, are found in practice to be sufficiently steam tight, although the wedge pieces and segments do not "unite to each other."

7. *A reciprocating engine of* 120 *horses' power moving at "the same pace"* with this rotary engine, implies such an absurdity, that even were it the case that such an engine would present only "*one-eighth*" part of the rubbing surface, compared to this engine, it would be a fact leading to no conclusion; but, if we compare it to a reciprocating engine with two cylinders (as the same regularity of motion could not be obtained with one) making even 40 *strokes* in the minute, we shall find that the rubbing surfaces are only double, though this by no means causes a proportionate friction.

8. The query "what packing will long endure a constant friction at the rate of 20 miles per hour?" may have this answer. A metallic one would, if all circumstances were alike, last something more than $\frac{1}{8}$th of the time of a common metallic piston, which generally moves at the rate of $2\frac{1}{2}$ miles per hour, since the Querist prefers calculating by *the mile;* but *wear* does not depend on speed only, for speed multiplied by force or pressure regulates it. Now it does not require much consideration to admit that the pressure on the packings of a piston which has to work up and down in a cylinder, and which packings are, at the same time, considerably affected by the motion of the piston-rod, cannot make steam tight without a much greater expanding force than that which the packings of this rotary engine require. There is, however, a more certain mode of ascertaining the probable wear of these packings than by comparing them with a piston; the action of which is totally different, since their motion is somewhat analogous to the motion and wear of the circumference of a shaft-gudgeon. Calculation shows that the top and bottom part of the brass that carries a 10-inch crank-shaft of a steam-engine, (in which the usual proportions are preserved) is exposed to an *average* pressure of about 50lbs. to the square inch. If therefore the speed of the circumference, which is

65 feet per minute, be multiplied by the the pressure 50lbs. we establish the number 3,250; which may be said to denote the wear. The segments of the rotary engine have been stated to sustain 160lbs. pressure all around, which is equal to about 1½lb. to the square inch; and their velocity being 1,837 feet per minute, will, if multiplied by 1½, give the number 2,755, as representing the wear. Hence it may with some confidence, be concluded, that when the packing-rings are made of proper materials to prevent galvanic action, they will wear about as long as the brasses that carry an engine-shaft, as stated.

It is asserted that the high speed which the *peculiar construction* of Mr. Ericsson's engine admits of is common to all "practicable rotary engines;" but which of all the attempts at rotary engines that have been made, are the "practicable" ones, is probably known only to Mr. Busby, since failure appears to have attended every attempt hitherto.

I am, Sir,
Your most obedient servant,
MECHANICUS.

London, October 2, 1832.

P.S.—I am at a loss to guess what Mr. Busby's motive can be for giving the hint about the "universal joint." The idea of the similarity, it must be confessed, is somewhat ludicrous.

Sir,—It has been suggested to me that I should point out *how* the friction of Mr. Ericsson's engine is increased *eight-fold* upon that of a common high-pressure steam-engine. In page 405, of the description, it is said that the engine shown in the engraving is to a 2 and ½ inch scale; and that the average of steam surface is equal to 10 square inches. Now a cylinder 3 and ⅔ inches diameter would give a piston equal to 10 square inches, and about 11 and ⅝ inches in circumference, which would, in that case, of course, be the length of the packing. In Mr. Ericsson's engine the length of the packing to the circumference of the circular plate, taken as stated, at 13 inches diameter, is 41 and ½ inches; that of the packing to the circumference of the cone, is 38 inches; the length of the packing to the edges of the two wings, is 9 and ½ inches; and the length of the *four* packings in the circular plate against the two wings, is 20 inches, making a total of 109 inches; which, in fact, gives 9 and ½ instead of 8 times the friction of an ordinary engine, supposing the two engines to operate with equal velocities. If Mr. Ericsson worked his engine *quicker* the friction would unavoidably be *increased* with the velocity, while the active mechanical pressure of the steam exerted upon the piston, or wing, which is in fact the piston, would be *diminished*.

In using this machine as a hydraulic engine, the leakage (in the absence of packing) would of course be 9 and ½ times that of an unpacked piston of 3 and ⅝ diameter; and an air vessel would, I suspect, be a desirable appendage to equalize the fluctuating pressure and inertia of the fluid upon the varying dimensions of those parts of the wings subjected alternately to its mechanical action. The engine would work with a *slow* motion to greatest advantage, as compared with the expense of water, because it is operated upon by pressure or gravity, and not by impulse; but, in order to obtain great power from a small machine, its action should be *rapid;* a circumstance at variance with the fundamental principle of its construction in the present instance.

I am, Sir,
Your very obedient servant,
C. A. BUSBY.

Stanhope-Place, Brunswick-Terrace,
Brighton,
September 29, 1832.

P.S.—The printer has erroneously substituted "diameter" for *chamber*, in lines 3rd and 4th of the third item; and the word "promoting" for *preventing*, in the second line of the sixth item of my last article, page 421.

C. A. B.

September 28, 1832.

Sir,—In the favourable notice you have given of Mr. Ericsson's rotary steam-engine, the objections to which the invention is liable, are overlooked; but, as they are, in my opinion, so great as to render the practical utility of the invention doubtful, I shall, with your permission, submit some of them to the consideration of your readers.

The first objection is the difficulty of construction, arising, from the mathematical accuracy of workmanship which is

requisite. The spherical portion must be ground into the cylindrical part, and form a steam-tight joint, without any kind of packing; then, after the cylindrical part is bored, a large portion of sphere must be turned in the dome and ground, as the packing of the piston and of the disc will pass over the junction of the dome and cylinder. The packing at the circumference of the cone is similar to the metallic packing of a common piston, and presents no difficulty; but that part of the packing in the revolving disc which presses against the leaves or pistons, requires to be brought to a sharp edge, which would, with difficulty, be made to form a steam-tight joint at first, and would soon be worn down by the friction in passing rapidly over the face of the pistons.

But the greatest objection is, that the only stop or abutment for the steam is formed by the contact of a cone and a plane surface; and, if we suppose the two surfaces to be perfectly true, the parts in contact will be merely a mathematical line or length without breadth, whilst the pressure of the steam will be exerted upon three-fourths of the area of the disc and cone to force the two surfaces asunder, and allow the escape of the steam. The least inequality also in the ball and socket joint, would, by changing the position of the axis of the disc, have the same effect.

The friction at the bearings, I should conclude, would be very great, as the shafts in those parts are very acute cones, and are forced into the bearings by the direct pressure of the steam exerted upon a large surface. For instance, in the engine represented in your work, with a dome 13 inches in diameter, with steam at 40lbs. pressure, the motive power would be only as the area of the piston (10 inches), and the pressure of the steam (40lbs.) or $10 \times 40 = 400$lbs.; whilst the steam would act upon $\frac{3}{4}$ of the surface of the cone or disc $= 99$ inches, or allowing 9 inches for the area of the shaft $= 90$ inches, to separate the surfaces of the cone and disc, and to force the axes into the bearings; thus, the force to cause leakage and friction would be 9 times as great as the working power.

For these reasons, I apprehend that the invention will not be found to answer in practice, although I readily admit it evinces great ingenuity and originality of idea on the part of Mr. Ericsson.

I understand that an engine on this principle is in a state of forwardness at Messrs. Maudslay and Co.'s. Will you favour your readers with an early account of its experimental performances?

I am, Sir,
Your most obedient,
J. Murdoch.
49, Hunter-street, Brunswick-square.

Remarks by the Editor.

The able letter of "Mechanicus" makes it unnecessary for us to trouble our readers with more than one or two of the remarks which we had to offer on Mr. Busby's objections. We think that "Mechanicus" has answered them all very satisfactorily, with the exception of the second. He observes, that "any one bestowing the least attention on the subject can see that steam *might find its way* between the cone and plane to cause any desirable counteraction of the tendency of the cone and plane to separate." Now, we must say there is nothing in Mr. Ericsson's specification, or in our description of the engine, which should lead any one to suppose that the tendency in question is intended to be counteracted in this way. We confess we were a good deal struck with the force of Mr. Busby's remarks on this head, and though we did come to the conclusion that there must be a *counteraction* established, and that this might be accomplished by the admission of steam *behind* the cone and plane, we meant, instead of intruding our own views on the subject, to have invited the patentee to state how he himself proposed to get rid of the difficulty. We consider it very material that this point should be cleared up, and hope Mr. Ericsson will take an early opportunity of doing so.

It will be observed, that a similar view of the tendency of the rolling surfaces to fly asunder, had occurred to Mr. Murdoch —and that before he could have seen Mr. Busby's communication. To Mr. Murdoch's other objections, however, we attach no more weight than we do to the residue of Mr. Busby's. His *first* is the difficulty of construction arising from the mathematical accuracy of workmanship which is requisite; to demonstrate which difficulty he describes the manner in which he imagines the spherical portion of the chamber "*must* be ground," &c. Now, it so happens, that his notion of the manner in which the thing "*must*" be done, is quite erroneous; and that the mode of construction actually adopted, so

far from being attended with any "difficulty," is such as to make any inaccuracy of workmanship nearly impossible. The mode, as it has been explained to us, is simply as follows:—Two parts of the chamber being cast, are first turned on the joint so as to make a good fit in the inside; the two parts are then fixed together by screw-bolts, and the whole affixed to the surface-plate of a lathe; a radial tool, moving on a fixed centre, is then applied, and the sphere bored out *at once;* after which the short cylindrical part is bored out whilst the sphere remains on the lathe. The ball and socket are brought to their proper place by means of the regulating brass K. The cover B is turned, and the centre bored out in the common way. As to the mode of making the outside parts of the joint *a a* steam-tight, any common workman knows more than one way of doing that. Mr. Murdoch's next objection is, "that part of the packing in the revolving disc which presses against the leaves *requires* to be brought to a sharp edge; which would with difficulty be made to form a steam-tight joint," &c. But why is this *required?* The surface of the oblique plane of an engine such as that represented in our engraving would be one-eighth of an inch outside the centre of the ball, so that the packing rod would form *an obtuse angle of* 144 *degrees*. Besides, this angle is presented towards the wing but for a single instant in passing the vertical line. Mr. M.'s "greatest objection," however, is that "the only stop or abutment for the steam is formed by the contact of a cone and a plane surface," a mere "mathematical line, or length without breadth!" Mr. M. should have considered that the side of the cone presents to the plane a hyperbolic line, which, on a distance of one-eighth of an inch on each side of the "mathematical line," that is, a quarter of an inch altogether, deviates from the surface of the plane only $\frac{1}{10000}$ parts of an inch on an average, which is about one-twelfth part of the thickness of paper (at 200 thicknesses to an inch). If we may not call this *contact*, in the literal sense of the word, it is at least such an approximation to it as reduces the loss from waste steam to next to nothing. If we even suppose the space between the cone and plane to be equal to the thickness of a sheet of paper—that is, twelve times thicker than it really is—the loss would be no more than one in twenty-six. For, in an engine of 39 inches diameter the side of the cone will be 16 inches, and allowing that the steam escapes with a velocity of 1000 feet per second, no more than 33 cubic feet of 45 lbs. steam = 5 lbs. weight, would escape every minute; while an engine of that magnitude (120-horse power) would require 120 lbs. of steam during the same time. We see no reason, therefore, to apprehend that a sufficient "stop or abutment for the steam" would ever be wanting.

We are again obliged, by want of room, to defer for another week our remarks on the application of Mr. Ericsson's invention to hydraulic purposes.

GRADUATION.

Sir,—I have waited in vain for information on this subject from those among your readers who are, as many no doubt are, more able to handle a subject so interesting to every lover of science, than I am. In such a case I feel called on, as the starter of the question (see Mech. Mag. vol. xvii. p. 185), to do my best to solve the difficulty it offers; not, however, of the particular case I put in my last communication, which I must still leave *in medio*, but of the more general question, "how best to apply the only unerring system of graduation, that of stepping, to the division of a circle."

My solution of the problem is as follows, and depends on the well-known mathematical fact, "that the peripheries of circles are to each other as their radii." If it be required to divide a circle into a given number of parts, find another circle whose radius shall be in the same proportion to that of the dividend circle, that one of the parts of the dividend circle is required to bear to the whole periphery; and the periphery of the circle so found will be an aliquot part of that of the dividend circle, and in the required proportion. Practically thus:—To divide a circle into 400 parts, fix it so as to revolve in a horizontal plane, step 400 equal successive parts on a radius, beginning from the centre. Prepare another circle, whose periphery is known by estimation to be somewhat greater than that of a circle described with one of the parts stepped as radius. Adjust this second circle so that it may revolve in contact with the plane of the former, but at a right angle with it; so also, that its axis of revolution, being fixed, may pass directly over the centre of the former, while the second circle itself may be moveable along its axis in a direction from the centre of the former towards its

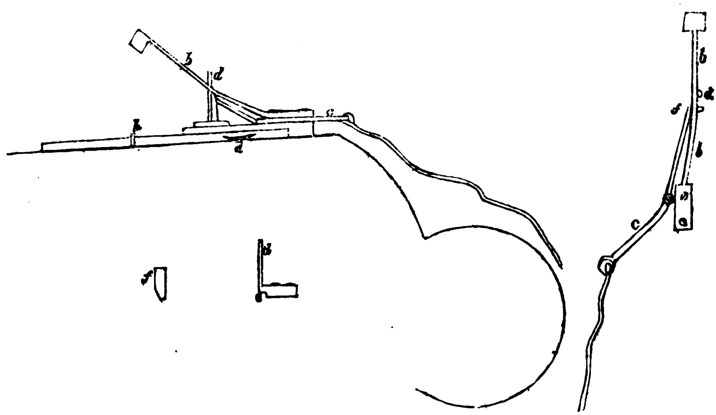
circumference. Let the second circle be now fixed so that its centre may be directly over the extremity of the first part stepped on the former. The horizontal circle is made to perform one complete revolution, and the periphery of the circle, so described at the extremity of part one, being taken up and noted, by microscopic observation and mechanical contrivance, on the limb of the vertical circle, may be transferred and laid down again on the limb of any concentric circle; being the $\frac{1}{10}$th part of a concentric circle described at the extremity of the 10th part, the $\frac{1}{100}$th of that at the extremity of the 100th part, the $\frac{1}{400}$th of that, which passes through the end of the 400th part, and so on.

I have the honour to be, Mr. Editor,

Your obedient servant,

Φ. M.

FRENCH PERCUSSION GUN LOCK.



Sir,—The lock, represented in the above drawings, fixes to the gun in the usual manner by *one* nut at *a*; the spring and hammer are both in one *b*; the trigger *c* has its upper part sloped a little, as shown in the separate front view of it *f*, by which means the spring is detained so as to require some force to liberate it; the guide *d* bears the spring a little on one side till it reaches the bottom, at which a part is filed away as at *e* in the side view.

When the trigger is pulled with the requisite force, the spring descends along the side of the guide *d*, the hammer strikes the cap at *h*, and immediately slips to the right into the notch *e*, by which means the vent is instantly comeatable to be stopped, pricked, and primed.

In cocking, the hammer is laid hold of and borne to the left sufficiently to clear the spring of the notch *e*; it is then lifted up and locked with the trigger as represented in the figure.

I was shown this lock by a very talented French officer, Captain Gequel des Touches; he spoke very highly of it, and I consider him a *practical* judge, as in addition to his having served in the ship which engaged the present Admiral Sir Edward Codrington at Trafalgar, he also was in the squadron which beat us in the Battle of Algesiras.

It is almost needless to add, that percussion locks are not yet introduced into our navy, although exceeding good ones have been offered to Government, and proved over and over again to be far superior to the flint ones, even to firing the powder at a distance of 14 inches.

I am, &c.

R. N.

RAPID PROGRESS OF THE RAILWAY SYSTEM IN AMERICA.

The railway system appears to be making much greater progress in the United States than in Great Britain. In almost every State there are railways either commenced or about to be commenced; and nothing less is anticipated than that in a few years the whole of the vast territory of the American Republic will be in possession of the benefits of this superior mode of communication. With us, on the contrary, the Liverpool and Manchester Railway is still the only considerable line for general traffic; for, thanks to the interdicting and discouraging influence of our House of *Lords*, not only has the execution of the projected line between Birmingham and the metropolis been postponed for the present, but the public taste for speculations of this kind has so much abated, that though there are many other promising railway schemes on foot — such as the Brighton, the Greenwich, and the Southampton (perhaps the best of all), none of them seem to be taken up with the adequate degree of spirit. The American Congress has recently passed an Act for the encouragement of this system of internal improvement, to which we fear it will be long before we can offer a parallel on this side of the Atlantic. It enacts that there shall be a drawback allowed of the duty on all iron employed "on railways or inclined planes." An "American Railroad Journal" has been also established at Baltimore for the purpose of recording every thing connected with the progress of railways in America, and diffusing a knowledge of all such inventions, discoveries, and scientific observations, as have a practical bearing on the art of locomotion. We are indebted to some unknown friend at Baltimore for a few of the latest numbers of this Journal, and have been much gratified by the perusal of them; their contents do great credit to the zeal, industry, and discrimination of the Editor (Mr. Minor). We extract from No. 36, the following general view of what has been done, is doing, and is proposed to be done in the way of railway making in the United States:—

"We deem the Baltimore and Ohio railroad one of the noblest enterprises ever undertaken in this country; it will be, when completed, the longest continuous line of railroad in the world. It will not, however, long remain so, as we with confidence anticipate the construction of an *Atlantic Railroad* passing through the principal cities in the Atlantic States, from Maine to Georgia,—upon which one may travel a thousand miles with as much ease as he can now travel the fourth part of it. Railroads will also intersect this country in various directions. One is projected, and already commenced, from Boston through New Hampshire, and Vermont to Ogdensburg, N. Y.: and it will not stop there; it will in a few sears be continued on through Jefferson, Oswego, Onondaga, and Courtlandt counties, to Binghamton, there to intersect the great Western Railroad from New York to Lake Erie—is it too much to say, to the Mississippi? There will also be the Pennsylvania and Maryland Railroads, and one from Harper's Ferry, through the valley of Virginia, to Tennessee. Will there not be another in Virginia from Richmond, to intersect the first in the valley? There is no doubt of it. "Old Virginia" cannot rest easy and see Baltimore take all the trade from the West; she *must* make a Railroad in self-defence. North Carolina, too, is calling loudly upon her sons to step forth and vindicate her character, to show the world that she is not to be left in the background. The Central Railroad, and also the Cape Fear and Yadkin Railroad, are projected, and a large portion, we believe, of the stock subscribed among her own inhabitants on the routes. This is as it should be. Those to be benefited should step forward and sustain the enterprise. North Carolina *will* have a Railroad or roads from her navigable waters to the mountains; and she, too, may pass those barriers, and claim a share of the riches of the West;—she will at least compete for it. As for South Carolina, she has done nobly in Railroads; she will soon have completed, and in operation, one hundred and thirty-five miles of Railroad in one line,—a greater extent than can be found elsewhere together. It certainly speaks loudly in favour of the enterprise and perseverance of the citizens of Charleston; for we presume it must be mainly attributed to their influence that it has progressed as it has. With an Atlantic railroad passing near the seaboard or through the principal cities from

Portland to Georgia, with others branching from it as from Boston to Ogdensburgh, from New York to Lake Erie, from Philadelphia to Pittsburgh, from Baltimore to Wheeling, with a branch through the Valley of Virginia, from Harper's Ferry, also, one from Richmond up James River and the mountains, and perhaps to the Ohio, one through North Carolina to Tennessee, and another from Charleston, S. C. to the same fertile country, we should have little apprehension of a dissolution of the *Union*. It may be asking too much of others to desire them to anticipate the half above enumerated, but for ourselves we have no doubt of the construction within a few years of the majority of them; together with numerous others of less magnitude not mentioned. The facilities for intercourse afforded by Railroads, will have a great influence in removing the prejudices now cherished by one section of country against another. They will enable us to visit different sections, to compare our *own* faults with theirs, and to find that there is not, after all, so much difference as we apprehended."

EXPEDITION TO ASCERTAIN THE FATE OF CAPTAIN ROSS.

Sir,—From a notice in the public papers during the last week, it appears that the Government has promised to advance £2,000 towards defraying the expense of an expedition to ascertain the fate of the adventurous Captain Ross, the hardy navigator of the polar seas, provided that the friends of Captain Ross will find a further sum of £3,000—a very wise precaution, to secure the effectual application of the national bounty. It was further stated, that the committee of Captain Ross's friends had entertained the idea of applying to the British nation for its subscriptions in aid of the expedition, but it does not appear whether this is still their determination or not. I now write to you to urge the committee to adopt this step; I am morally certain it would be a successful one. Let not the committee be ashamed of such a proceeding, as though it would seem to entreat the *charitable* consideration of the public. I have no hesitation in saying that every person who would be generous enough to subscribe his guinea, would be equally ready to acknowledge that it was but an offering which humanity, and gratitude, and admiration of public spirit, combined to require at his hands. The Government grant recognises the *public* character of Captain Ross's enterprise, while his talents, his zeal, his daring, and devotion, and the melancholy uncertainty of his fate, engage the admiration and anxious sympathy of every right feeling individual. The committee must not do the British nation the injustice to suppose that it is careless whether Ross yet exists or has perished; whichever be his fate, it feels interested to know the circumstances attending it, and will gladly render its assistance to discover them. Let, therefore, a public meeting be called to consider the subject, and I am confident that there will be found no deficiency of sympathy in the fate of Ross. The merchant, and the man of science, and the philanthropist, will unite their partial and particular sympathies with the more generous feeling of anxiety, which, as men, they entertain in common with every humane and patriotic Briton, to preserve the name, and, perhaps, the life of Ross.

I am, Sir,
Your very faithful servant,
An "Auld Acquaintance,"
AURUM.

[We think it would probably suffice were the committee to announce that books are opened for the receipt of subscriptions. We can state of our own personal knowledge, that sentiments similar to those which our esteemed correspondent, "Aurum," has so well expressed on the subject, are very extensively entertained. £5,000 is but a small sum for an expedition of such duration and peril as this must needs be; it would require to be at least trebled or quadrupled to give it a reasonable chance of success.—ED. M. M.]

DIVING APPARATUS.

Sir,—I presume the description of Mr. Bell's diving apparatus, at page 365, which closely resembles that of Mr. Dean, will have supplied the wishes of your correspondent Mr. Elliott. I may, however, observe, that the apparatus of Messrs. Bell and Dean is in no way like that of Mr. Steele, which consisted of certain improvements in diving-bells, very

fully described in your 6th volume; neither is it like the plan submitted by T. B., at page 185, vol. 4, which was a proposal for furnishing the diver with a supply of fresh air from reservoirs into which it had been previously condensed.

Mr. Dean first proposed to use his apparatus for the purpose of entering houses on fire, or any other places filled with smoke or noxious vapours without danger of suffocation, and exhibited it at the public meeting of the late Society for preventing loss of life by fire, in February, 1829; when he fully proved its efficiency for this purpose. An account of the experiment, and a description of the apparatus, may be found in the 3rd volume, new series, of the Register of Arts. As a diving apparatus, it is much older than many persons have imagined; an apparatus, precisely similar, being described by Mr. Clare, in his well-known work on the Motion of Fluids, published a hundred years ago.

On the pier at Ryde, a fortnight since, I saw various articles which Mr. Dean had brought up from the ocean bed; and on the gun-wharf at Portsmouth, I saw two large iron guns which Mr. D. had got from the wreck of the Boyne. The action of the sea-water on these guns for thirty years, had corroded them so much that they were quite useless; and it is questioned, if metal enough would be obtained from them to be worth the melting.

Brass guns, plate, or dollars, would be well worth bringing up, but they appear as difficult of access at the bottom of the sea, as they are usually found to be on terra-firma—that is, they are not to be had for the trouble of picking-up.

Mr. Dean and Mr. Bell both deserve success, for their endeavours to bring into practice a method of diving, which, I am of opinion, will eventually be found the best hitherto devised, although suffered to be neglected for so great a length of time.

I am, Sir,
Yours, respectfully,
W. BADDELEY.

Sept. 24, 1832.

AUDUBONIANA.

Sir,—As Mr. Audubon's friend and champion, "Quivis," appears to think you went out of your way a little, as a cultivator of mechanical science, in impugning the credibility of Audubon's rattlesnake stories, I beg leave to forward to you two or three other stories, selected from his *Ornithological Biography*, which depend on evidence, so strictly of a mechanical nature, that the degree of credence to be given to them can be discussed no where with more propriety than in your pages. They all relate to the extraordinary skill of the Kentuckians in rifle-shooting. The first, I should call simply possible; the second, very improbable; the third, (for obvious reasons), utterly impossible. Yet Mr. Audubon, be it observed, vouches equally for the truth of all three.

1. *Driving the Nail.*—"Several individuals, who conceive themselves expert in the management of the gun, are often seen to meet for the purpose of displaying their skill, and betting a trifling sum, put up a target, in the centre of which a common-sized nail is hammered for about two-thirds of its length. The marksmen make choice of what they consider a proper distance, which may be forty paces. Each man cleans the interior of his tube, which is called *wiping* it, places a ball in the palm of his hand, pouring as much powder from his horn upon it as will cover it. This quantity is supposed to be sufficient for any distance within a hundred yards. A shot which comes very close to the nail is considered as that of an indifferent marksman; the bending of the nail is, of course, somewhat better; but nothing less than hitting it right on the head is satisfactory. Well, kind reader, one out of the three shots generally hits the nail; and should the shooters amount to half a dozen, two nails are frequently needed before each can have a shot. Those who drive the nail have a further trial amongst themselves, and the two best shots out of these generally settle the affair, when all the sportsmen adjourn to some house, and spend an hour or two in friendly intercourse, appointing, before they part, a day for another trial. This is technically termed *Driving the Nail.*"

2. *Barking off Squirrels.*—"This is a delightful sport, and, in my opinion, requires a greater degree of accuracy than any other. I first witnessed this manner of procuring squirrels, whilst near the town of Frankfort. The performer was the celebrated Daniel Boon. We walked

out together, and followed the rocky margins of the Kentucky river, until we reached a piece of flat land thickly covered with black walnuts, oaks, and hickories. As the general mast was a good one that year, squirrels were seen gamboling on every tree around us. My companion, a stout, hale, and athletic man, dressed in a homespun hunting-shirt, bare-legged, and moccasined, carried a long and heavy rifle, which, as he was loading it, he said had proved efficient in all his former undertakings, and which he hoped would not fail on this occasion, as he felt proud to show me his skill. The gun was wiped, the powder measured, the ball patched with six-hundred-thread linen, and the charge sent home with a hickory rod. We moved not a step from the place, for the squirrels were so numerous that it was unnecessary to go after them. Boon pointed to one of these animals which had observed us, and was crouched on a branch about fifty paces distant, and bade me mark well the spot where the ball should hit. He raised his piece gradually until the *bead* (that being the name given by the Kentuckians to the *sight*) of the barrel was brought to a line with the spot which he intended to hit. The whip-like report resounded through the woods and along the hills, in repeated echoes. Judge of my surprise when I perceived that the ball had hit the piece of the bark immediately beneath the squirrel, and shivered it into splinters, the concussion produced by which had killed the animal, and sent it whirling through the air, as if it had been blown up by the explosion of a powder magazine. Boon kept up his firing, and, before many hours had elapsed, we had procured as many squirrels as we wished; for you must know, kind reader, that to load a rifle requires only a moment, and that if it is wiped once after each shot, it will do duty for hours. Since that first interview with our veteran Boon, I have seen many other individuals perform the same feat."

3. "*Snuffing the Candle.*—I first had an opportunity of seeing the snuffing of a candle with a ball, near the banks of Green River, not far from a large pigeon-roost, to which I had previously made a visit. I heard many reports of guns during the early part of a dark night, and knowing them to be those of rifles, I went towards the spot to ascertain the cause. On reaching the place, I was welcomed by a dozen of tall stout men, who told me they were exercising for the purpose of enabling them to shoot under night at the reflected light from the eyes of a deer or wolf, by torch-light. A fire was blazing near, the smoke of which rose curling among the thick foliage of the trees. At a distance which rendered it scarcely distinguishable, stood a burning candle, as if intended for an offering to the goddess of night, but which, in reality, was only fifty yards from the spot on which we all stood. One man was within a few yards of it, to watch the effect of the shots, as well as to light the candle should it chance to go out, or to replace it should the shot cut it across. Each marksman shot in his turn. Some never hit either the snuff or the candle, and were congratulated with a loud laugh; while others *actually snuffed the candle* WITHOUT PUTTING IT OUT, and were recompensed for their dexterity with numerous hurrahs. One of them, who was particularly expert, was very fortunate, and *snuffed the candle three times out of seven*, whilst all the other shots either put out the candle, or cut it immediately under the light."

Perhaps G. S., Iver Maciver, or some other of your clever mathematical correspondents will favour us with a regular investigation of the probabilities of this last miracle of skill. The question to solve will be this:—How near may the course of a ball approach the flame of a candle at the distance of fifty yards from the place of firing, without blowing it out?

I remain, Sir, your obedient servant,

PERCUSSION CAP.

We do not look upon the first and second of these stories as so very improbable. We subjoin a whole chapter of good markmanship, compared with most of the incidents in which both driving the nail and barking off squirrels are but secondary performances.—ED. M. M.

"The arrow that deprived Philip of his right eye was *marked* with the object at which it was successfully aimed. Domitian used to amuse himself by shooting the arrow between the fingers of boys in the circus, who were made to hold their hands against the target for marks of the Emperor's skill. The Emperor Commodus had a pastime of transfixing the wild beasts at the moment of

their seizing on the criminals, who had to fight them in the arena; but the greater boast was to cut off the head of the ostrich, the greatest of living things, in its most rapid career. Zosimus and Quintus Curtius bear testimony to similar examples of skill; and we may quote the better known, but more disputed, history of William Tell and the apple. The American Indians that used to resort to Charleston, in South Carolina, once a year for their donation of blankets, &c., for small pieces of money, or a glass of rum, would exhibit their wonderful skill with the bow and arrow, which were, however, very small. Putting a coin of the size of a sixpence edgeways in the bark of a tree, they would retire backwards till the coin was invisible to a European, when they would let fly the arrow, and never fail in splitting the coin! The animal senses of savages are acute beyond the conception of men in civilized society.—*United Service Journal*, No. XLVI. p. 32.

REPORT OF THE FRENCH BOARD OF LONGITUDE ON THE COMET OF 1832,

*Which on the 29th of October next will Cross the Earth's Orbit.**

1. The public has been a good deal occupied about the comet which is to reappear in 1832. Many of the daily papers in France have even asserted that this comet will impinge upon the earth and break it to pieces; the Board of Longitude has, therefore, thought it advisable to give, in this notice, all that science has hitherto discovered with precision, with certainty, and mathematically, on the route of this heavenly body. This was at first the only object of this article, but, the plan having extended itself, I have been induced to occupy myself, not only with the supposed dangers with which we are threatened by the approaching comet, but I have also discussed the parts and agency which some illustrious philosophers have allotted to many comets, which have appeared in former times, in their explanations of the great physical revolutions to which our globe has been subject.

2. What is that we call a comet?—A comet, etymologically considered, means a star with a head of hair. The most luminous point, seen at or near the centre, is called the nucleus. The nebulosity, or foggy luminous aureola, which surrounds the nucleus on every side, is called the hair. The nucleus, and this hair together, form the head of the comet. The luminous trains, some long, some short, with which most comets are accompanied, whatever direction they may be projected in, are called tails.

The peculiar motions of comets through the heavens distinguish them from those new stars, recorded in the history of astronomy, which have appeared suddenly in certain constellations, and which have there been extinguished without changing their place.

The extreme elongation of their orbits forms a marked difference between comets and planets, although when Herschel first discovered Uranus, some observation was necessary before it was decided that this star was not a comet, although it had neither tail nor hair. It was only after an attentive study of the motion of Uranus, that it was proved that this planet described almost a circle round the sun.

3. Nature of cometary orbits, and their elements.

Comets, which some ancient philosophers considered as meteors, originating in our atmosphere, are in fact real stars. The simultaneous observations made on them at different stations in the earth, at great distance from each other, proves this.

Since the time of Tycho, who made this discovery, it has been ascertained that comets revolve round the sun, according to regular laws, similar to those which regulate the planetary movements, only that their orbits are very long ellipses, of which the sun always occupies one of the foci. The summit of the ellipse nearest the sun is called the perihelion; the opposite point of the ellipse is called the aphelion. These, and all the other technical terms, should be remembered.

Comets are seldom seen from the earth, except when near their perihelion; and, although it cannot well be given here, a simple calculation demonstrates that three observations made on a comet from the earth are sufficient to determine its orbit.*

* This report was drawn up by M. Arago, and the present translation of it appeared at intervals a considerable time ago in the *Times*. We now republish it, at the suggestion of a learned Correspondent, who thinks that "a document of so much scientific importance and great general interest, is deserving of a more fitting place of record amongst us, than the fleeting columns of a daily newspaper." We shall be obliged to give it in successive portions, but we have so arranged the publication of them (nothing like being prepared for the worst!) that the whole shall appear before the important day, on which the momentous contingency which the subject involves will be determined.—Ed. M M.

* M. Arago here enters into some considerations of the properties of the parabola and ellipsis, as well as into some astronomical definitions too profound for the general reader.—Tr.

4. On the means of knowing when a comet appears, if it be a new one, or if it has been seen before.

As soon as a comet has been observed three times, astronomers can calculate its orbit; and they immediately examine and inquire whether or no the elements of this orbit have been previously registered in the catalogue of comets. By following up this inquiry, and by attending to other particulars well known to astronomers, they can decide whether or no the comet under consideration has appeared before or not; and in this way Halley has shown us, that the comets, seen by Kepler, in 1607, and by himself in 1682, were identical—that is, they were the same comet. This gives us an interval of seventy-five years; and if Halley's conjecture were correct, this same comet ought to have appeared about seventy-five years before 1607; and, in fact, a comet was observed at Ingoldstadt, in 1531—that is, seventy-six years before 1607—whose inclination, longitude, and other elements of its orbit, agreed with the two succeeding ones, and astronomers no longer doubted the identity of these three comets.

Halley, on this, immediately predicted that this comet would re-appear at the end of 1758, or the beginning of 1759, the elements of whose orbit would differ but little from those just noticed, and this prediction having been fulfilled, at once gave a new era in cometary astronomy. But Halley was prevented from being very precise as to time, from his belief that the motion of this comet would be retarded by the attraction of two of the planets, and that it would employ about 618 days more to reach its perihelion than it did in the preceding revolution; that is, 100 days from the effect of Saturn, and 518 days from the action of Jupiter. The appearance of this comet, therefore, at its perihelion, was calculated by Halley for about the middle of April, 1759. Clairaut, however, discovered that Halley had neglected some small elements, and showed that this comet would be at its perihelion on the 12th of March, 1759, and the event justified these calculations.

5. No doubt being therefore left as to the identity of this comet, M. Damoiseau, of the Board of Longitude, having by immense labour taken into calculation all the causes of perturbation which will affect this comet on its return, particularly the effect of the planet Uranus, whose existence was not known in the time of Clairaut, this astronomer, our colleague, has lately come to the following conclusion:—viz., "The interval between the arrival of the comet of 1759 and that of its approaching arrival at its perihelion will be 28,007 days, which, reckoning from the 12th of March, 1759, will bring us to the 16th of November, 1835." Thus, then, in the middle of November, 1835, we shall see again passing near the sun, that comet which, in 1456, with a tail of sixty degrees in length, terrified all Europe by its brilliancy, by causing astrological predictions, and by a superstitious application of its appearance to the then fearful progress of the Mahometan arms.

6. M. Arago here enters into some details on the comet of 1767 and 1770, whose revolution was fixed at five years and a half by accurate observation; but he tells us, too, that in 1767, when that comet approached Jupiter, its elliptical orbit was not of five, but of fifty years, and that afterwards, in 1779, on this comet's emerging from the sphere of Jupiter's attraction, its orbit was so altered from what it had been in 1770, that its duration was of twenty years." "Hence," says he, "we are justified in concluding that this comet of 1770 was brought within the sphere of our vision in 1767 by the action of Jupiter, and that in 1779 its orbit was so lengthened by the same action that we lost sight of it."

7. We now come to the comet usually called "the comet of the Short Period."

This comet was discovered at Marseilles in 1818, by M. Pons; and M. Bouvard presented the elements of its orbit to the Board of Longitude, in January, 1819. A member of the Board was struck with the similarity of these elements to those of a comet observed in 1805, and no doubt was entertained that these comets were the same. It was then suggested that the comet might have returned more than once in the thirteen years which had elapsed between 1805 and 1818, and this was found to be the truth by M. Encke, of Berlin, who established by indisputable calculations that the elliptical orbit of this comet was completed in about 1,200 days, or about 33-10ths years. This period of its revolution has been since established by actual observation, for this comet of 1818 re-appeared in 1822, in 1825, and in 1829, in the places assigned to it by M. Encke beforehand, with very little variation, of which we shall consider the causes presently. This comet will reach its perihelion the 4th of May, 1832, but the astronomers of the Cape of Good Hope, and of New Holland, will be much more advantageously situated to observe it than those of Europe.

8. The comet of 6¾ years.—We are now arrived in our list at another comet, which will re-appear in 1832, and whose proximity to us will be, we are assured, so fatal to the earth and its inhabitants.

endanger the lives of the persons engaged therein." The accidents from this cause

This comet, which astronomers have agreed to call the 6¾ years comet, and which has been announced by several writers as threatening our globe with such dreadful ruin during this year of 1832, was first perceived at Johannisberg by M. Biela, on the 27th of February, 1826, and ten days after by M. Gambart, at Marseilles, who, calculating its parabolic elements, ascertained that this comet had been observed before in 1805 and in 1772. This comet, therefore, is periodical, and it became necessary, in order to determine accurately the time of its revolution, to quit the parabolic elements, and to found calculations on its elliptical elements. M.M. Clausen and Gambart undertook this calculation, and they both came to the result, that this comet revolved round the sun in something less than seven years.

(To be continued.)

INQUIRIES.

Sir,—I am desirous of knowing whether any method has been used to apply the force of a small stream of water, having a fall of about 60 or 70 feet, by hydraulic pressure to raise a larger portion a less distance. I want such a force to produce power by raising a portion of waste water, about 6 or 8 feet in height, into a water-wheel by a stream about 300 yards' distance, having a fall as above. It will be seen from the subjoined, from the Imperial Magazine, that such a method has been tried on a small scale with success.

I remain, Sir, yours, respectfully,
A. B. C.

Extract:

"*Domestic Self-acting Pump.* — That such a pump is perfectly applicable to all domestic purposes, is proved by the fact of a very small one having continued working for three months without being touched, raising about two tons of water in 24 hours; it acts entirely without friction, and by its means, the rain water collected at the top of a house will pump up a corresponding quantity of water from a well, as deep as the house is high. Its principle depends upon the alternate filling and emptying of four reservoirs with air and water by means of pipes and valves: invented by James Hunter, Esq., of Thurston, in Scotland—the principle of which is to raise water above the original reservoir by the descent of a certain portion of it."—*Imperial Magazine*, December, 1819.

Sir,—I should be very much obliged to any of your readers, who can inform me if a map of the globe is published, divided into northern and southern hemispheres, instead of east and west, as usual. I have made numerous inquiries, but hitherto without success. There are maps published containing the regions of the Poles as far as the tropics, or nearly so, but I cannot meet with one extending to the equator.

Yours, truly obliged,
C. T. V.

Islington, Sept. 18, 1832.

Sir, Will any of your correspondents be kind enough to communicate the process of repreparing any part of a stone, where an inked line has been scraped out, for the reception of other lines, or chalk? and favour yours,

F. R.

Sir,—Amongst the numerous scientific men who are members of the Mechanics' Institutions, or readers of that valuable and interesting publication of which you are the editor, there are some, perhaps, who are aware of, or can propose a plan of a machine for performing the operation of sewing, in a more expeditious and equally-effective mode than the one usually adopted by shoemakers. I have been informed that a machine has been invented, and is in use in the glove manufactories, for stitching together the several parts of the glove when the edges are parallel with each other, with the sort of stitch made use of by shoe-makers when sowing on the sole. If this information be correct, I should feel grateful to any person for a description of such a machine, or of any other which the fertile imagination of an English mechanic may invent.

Yours, respectfully,
A Novice.

Bristol, August 29, 1832.

ANSWERS TO INQUIRIES.

Wheels.—"E.'s" cabriolet will be easier drawn with four wheels than with two, on the principle that the more the weight is distributed, the less will be its pressure. Wheels do act as levers in propelling vehicles, but it does not, therefore, follow, that the larger the wheel the greater the power: because, after a certain point (found in practice to be six feet), the requisite increase in the strength, and, consequently, weight of the wheel, more than counterbalances the advantage gained by the extension of the leverage.

Combustion from Percussion.—Mr. Bickford is right in supposing, that "a powerful percussive force exerted immediately on the charge in the process of ramming, or tamping, will ignite the powder and

have been numerous. Is he quite certain of the truth of the statement contained in the following sentence? We are at a loss to discover *the sufficient reason.* "It may be observed, that *oblique* percussion will not produce that result, but in a very rare case; nor, indeed, at all, but by an accidental spark from the collision of the two bodies, which I never witnessed to be sufficiently strong *on an anvil* to cause combustion."

Cleaning Old Paintings.—"An Amateur" may make use of the following preparation; but he will please to observe, that it will apply to *oil* paintings only. Take two ounces of muriatic acid and three quarters of an ounce of litharge, and mix them well together; let them stand half-an-hour, and the preparation will be then fit for use. In using it, dip a sponge in the liquid and rub it over the painting for some fifteen or twenty minutes; then wash off with soap and water. Thenard, the celebrated chemist, found that oxygenated water answered admirably for the restoration of old pictures—the whites in particular; but we have been told by a friend, that it is a preparation so difficult to procure, that he applied for it in vain to at least twenty of the best chemical shops in town.

Earthenware Glazes.—"An Inquirer" asks for more information than we can give him in a small space. He ought to consult Parkes', or rather Shaw's History of the Potteries, for Parkes is often very inaccurate. Salt was at first the only glaze, but afterwards saffre, manganese, Cornish stone, &c, were introduced in different proportions; and hence all the varieties of pottery, from the plain white-stone to the fine porcelain, which now rivals the best productions of the East.

Wigan Railway.—The Wigan branch railway has now been opened for the conveyance of passengers and goods. It is seven miles long, and very nearly straight and level. The journey between Liverpool and Wigan, which formerly occupied upwards of three hours, will now be performed in about an hour. The railway joins the Liverpool and Manchester line, at Parkside, and is worked by locomotive power. It was constructed under the direction of Mr. Vignoles.

Eradicating Trees.—Sir, In No. 463, S. P. A. asks whether "a powerful press, made on the principle of Bramah's hydraulic-press, would raise the roots of trees from the ground?" I beg to inform him, that about twenty years ago, Mr. B.'s press was publicly and successfully used for that purpose, both in Hyde Park and St. James's.—I am, &c. T. L. D.

Wonderful if True.—The new steam-boat Patrick Henry, built in Baltimore, to run between Norfolk and Richmond, performed the distance (145 miles) on Monday last in seven hours and 43 minutes, after the stoppages were deducted.—*National Gazette.*—That is, at the rate of nearly twenty miles an hour!

Church Pews.—I am rather surprised that your Bayswater correspondent R. could so far misunderstand me as to draw general inferences from the objections I made to a particular case; but it must be confessed, she has argued very prettily upon what ought to be [see page 290], instead of confining her remarks to what really is. She says my objections are not of a nature to stand the test of time. I hope and trust they are not. The same may be said of the six-inch set-off at the upper part of her pew-back, which is confessedly made to accommodate the present fashion, when who knows that the next change may not introduce bonnets that will project ten inches (in lieu of five) beyond the perpendicular of the back.—Yours, respectfully, TREBOR VALENTINE.

Earthenware Chariot.—"In No. 473 of the Mechanics' Magazine, mention is made of an earthenware table. In Walpoliana I find the following:—'Concerning the Etrurian earthenware, see Plutarch's Life of Publicola, where there is a long and curious passage mentioning a chariot made of earthenware, a point of perfection to which it has not arrived among us.'"—W. R., Sept. 26, 1832.

"*Righting*" *a Church Steeple.*—The church of Wybunbury, near Nantwich, having sunk very much on the north side, it was considered necessary to take down the nave entirely; but the tower, which has declined 5 feet 11 inches from the perpendicular, being a very fine one, Mr. Thrubshaw, the architect, has engaged to set it right without disturbing the structure, and the following ingenious though somewhat hazardous plan has been adopted:—An iron girder has been passed through the steeple from north to south, and has been secured by strong plates at each end; the earth has been removed from the inside to the depth of several feet below the foundation, which has been laid bare on the outside, and such stones as might bind the base on the north have been broken. Under the foundation, on the south side, a row of holes, in a horizontal line, have been bored under the foundation from within by a screw-auger, which it is expected will cause the foundation on that side to sink; and by repeating this operation, it is considered that a sufficient quantity of earth may be removed, so as to allow the tower to right itself without damaging the fabric. It is understood that the whole building will be restored about March, 1834.—*Macclesfield Courier.*

INTERIM NOTICES.

The Supplement to Vol. XVII. with a Portrait on Steel of Eli Whitney, the Inventor of the Cotton Gin, will be published on the 1st of November. Also, Volume XVII. complete, price, in boards, 8s.

T. M. B. protests against being included among those who have admitted the correctness of the strictures of F. H. on the Useful Knowledge Society, and says, he accused him "of gross partiality, and exceeding unfairness." It is true he did so; but it is equally true, that he did not offer the slightest evidence in support of his accusation, and still deals only in general assertions.

"A Subscriber" at York is recommended to make use of Sanderson's Algebra, or Euler's, translated by Barlow. We know of none better suited to a person desirous of acquiring a knowledge of algebra "without the aid of a master."

Communications received from Bob Stay—A Country Gentleman—Mr. Nutt—A Practical Engineer—J. W.—Pip.

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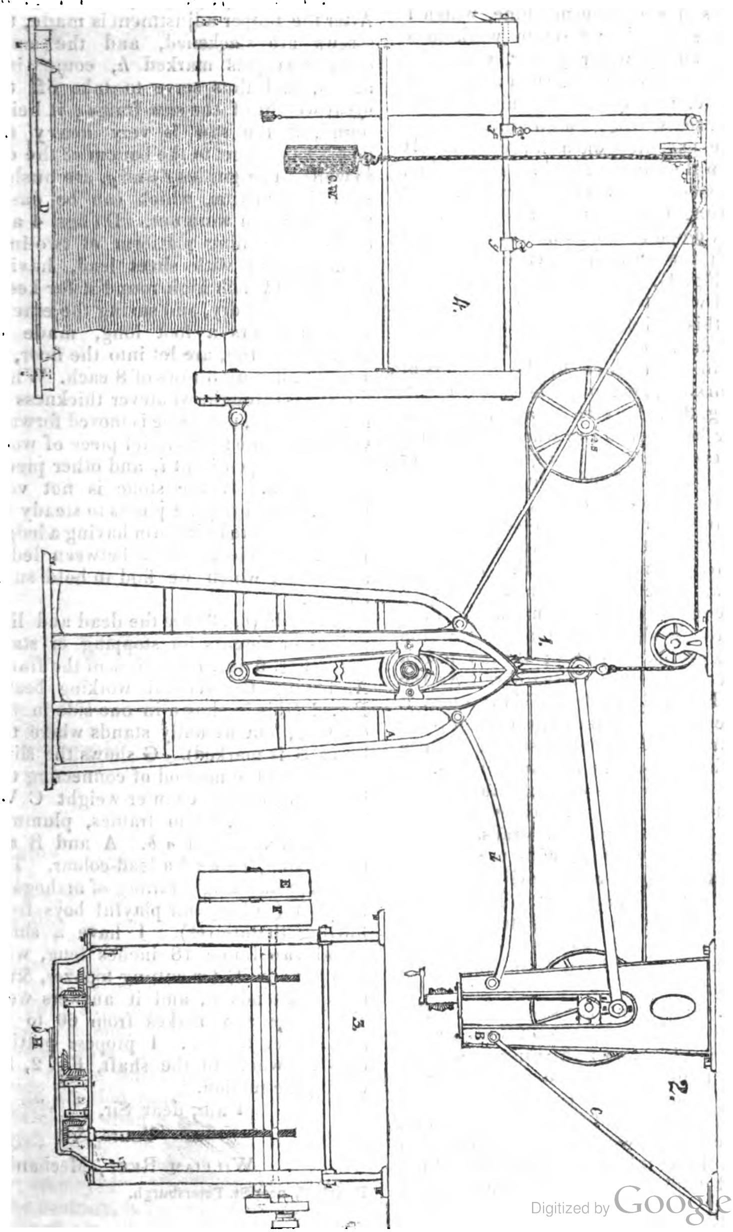
Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 479.] SATURDAY, OCTOBER 13, 1832. [Price 3d.

RUSSIAN GEM-CUTTING MACHINE.



RUSSIAN GEM CUTTING MACHINE,

Constructed by Mr. William Reed, for the Peterhoff Works, near St. Petersburgh.

Dear Sir, I herewith send you some drawings of a sawing-machine, which I have constructed and set to work in a mill driven by water power, where all sorts of lapidary's work, such as vases of malachite, porphyry, &c., inlaid tables of stone, seals, rings, and diamond grinding, are executed on a large scale. It works in the common horizontal position, but possesses this novel feature, that the levers, beam, driving shaft, &c., are lowered down as the frame saw descends through the cut. The vertical beam or lever (Fig. 1), having a counter balance of lead weights (C W) in a convenient place, this weight is lifted once or twice in the day, according as the attendant sees it to be required by the progress of the work. The moveable shaft, Fig. 2 and Fig. 3, is lowered by a handle turning the bevil (or mitre wheels) and upright screws tapped through the bar over the shaft, and fixed into the moving plummer-blocks, *a*, Fig. 2, which blocks, and the other plummer-blocks marked *b*, are made to slide up and down their respective frames A and B. The separate frames being fixed on wood floors, they required iron stays, marked *c*, *d*, *e*. The driving shaft (first motion) and iron riggar, are marked D S; the strap is a 4-inch double one of leather. As the shaft, Fig. 2, in its frame B descends, it will be requisite to let out the strap three or four inches; being fastened with a lace, this is done in a few minutes. I prefer this to a stretching-frame and weights, which, in most cases, are bad, being great destroyers of straps. Fig. 3 is a front view of B, with the moving shaft, showing how the bevil wheels are turned with the handle H. The shaft is lowered as the saw requires to the bottom of the cut, when it is raised up together with the levers and saw-frame to begin a new cut.

Fig. 4 represents the saw-frame. The two upright pieces are of beach; the stretching bar and tightening rod are of iron. I intend to have different saw-frames—some with two saws—to suit the different sizes of the stones to be cut. I commenced with a slab of Siberian agate, 4 feet 6 inches by 2 feet 3 inches; and through such a substance it cuts at the rate of an inch and a half per day. For keeping the saw in an upright position, there are two parallel rods, with brass sockets and set screws, about 2 feet apart, marked *f*, *g*, (shown in Fig. 5). After the proper adjustment is made, the screws are slackened, and the small counter-weights marked *h*, come into action, and thus serve to take off the great weight of the saw-frame; it being found, if the saw is very heavy the emery cannot get to the bottom of the cut so well. The guides *f* and *g*, are bushed with lignum vitæ, which can be easily renewed when worn out. D (figs. 4 and 5) is the sliding platform of two-inch oak, covered with sheet lead, having edges of 1½-inch high round it for keeping the frame dry, and saving the emery. Friction rollers a foot long, made of inch round iron, are let into the floor, or a frame, having 3 rows of 8 each. When the cut is through, whatever thickness is next required, the frame is moved forward with the stone; a parallel piece of wood is then dropped in at *i*, and other pieces fixed at *k*. If the stone is not very heavy, it will require pieces to steady it; the lead-covered platform having a ledge, I put flat pieces tight between ledge and stone, which we find to hold sufficiently.

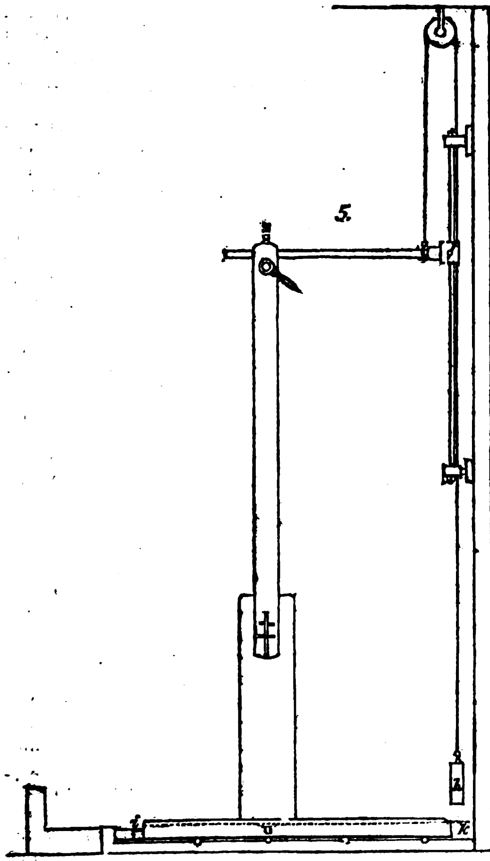
E and F (fig. 3) are the dead and live pullies or riggars for stopping or starting. Fig. 6 is a front view of the frame A, having the vertical working beam, Fig. 1 (this is shown in one side in the drawing, but actually stands where the letter S is marked). G shows the sling frame, and the method of connecting the beam with the counter-weight C W. The standards, beam frames, plummer blocks, &c. marked *a b*. A and B are of cast iron, painted a lead-colour. The machine has a light railing of mahogany round it (to keep our playful boys from hurting themselves). I have a small metal saw-frame 18 inches long, with four saws in it, for cutting topazes, &c.; a boy attends it, and it answers well. The large saw makes from 60 to 70 strokes per minute. I propose putting on a fly wheel to the shaft, Fig. 2, for easing the motion.

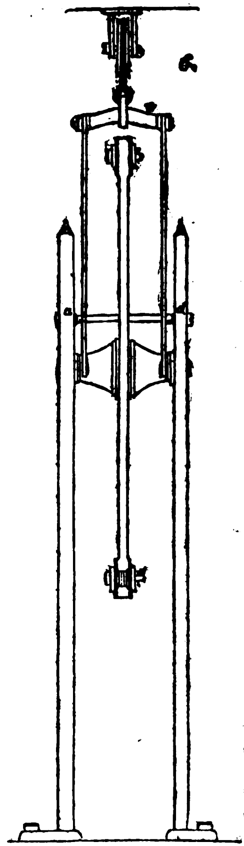
I am, dear Sir,

Yours, &c.

WILLIAM REED, Mechanist.

Peterhoff, near St. Petersburgh.





ERICSSON'S STEAM-ENGINE AND WATER-MILL.

We now proceed to consider the applicability of this engine as a water-mill. If we are not greatly mistaken, it possesses properties in this respect, which will go far, to restore water to its ancient superiority as a motive power.

The common water-wheel, as the reader is aware, is moved by the specific gravity of the water lodged in its buckets; its position must be vertical, and its diameter (when a maximum effect is desired) cannot be made *less* than the perpendicular height of the face of water employed. Mr. Ericsson's wheel, on the contrary, is moved by pressure on its wings caused by the specific gravity of a column of water—its motion may be, therefore, *either* horizontal or vertical—and for obtaining a maximum effect, its diameter will form only a small portion of the perpendicular height of the waterfall.

It is further well known, that the practical effect of a water-wheel falls very much short of the power that is represented, by multiplying the weight of water used by the height of the fall; the proportion between the power expended and the effect obtained, being generally considered to be as two to *three*.

The sources of this loss are—1. the power expended in putting the water into motion—2. the diminution of spe-

cific gravity caused by the centrifugal force—and 3, the unavoidable gradual discharge of the buckets before they reach the lower extremity of the wheel. The first of these sources of loss is the only one which exists in the case of Mr. Ericsson's wheel, and, fortunately, it is of the three, that which is of the least consequence. To judge how much it will diminish the practical result, let us suppose the engine to work under a column of 30 feet. If the engine were to move at the slowest possible speed, the whole might or pressure of the column would evidently urge the wing round, but if the speed be increased, part of the pressure must be expended in putting the water continually into an equal velocity with the wing, or greater, in proportion as the aperture of entrance is less than the surface of the wing. For ordinary purposes, this speed will be seven feet per second, and there will, therefore, be as much lost out of the 30 feet as the height of a column that will produce seven feet velocity per second; which is, in practice, 1.7 foot. The centrifugal force will not diminish the pressure against the wing, and as very little additional velocity of the water is required in the discharge, it may safely be calculated that *nine-tenths* of the weight of the column will be actually exerted in turning the engine round.

As, for the reasons given before, the full power of a waterfall cannot be communicated to machinery by means of a *common* water-wheel without giving it a diameter at least equal to the height of the fall, the wheel becomes of necessity a very heavy and cumbersome mass, which it requires a large and often expensive structure to contain. Besides this, there is a great practical inconvenience caused by the large size of the wheel; namely, that a very few revolutions are performed in a given time, while most kinds of machinery require a comparatively quick motion. Wherever speed, therefore, is wanted, from such a slow first mover, it can only be obtained by multiplying gearwork. Now, with Mr. Ericsson's engine, you have all the power of the large common wheel without the bulk. It is applicable to falls of any height; so that water may be conveyed through pipes from great elevations, and applied with every convenience; producing an effect exactly proportionate to the perpendicular descent. The position too of the wheel may, as before stated, be either *vertical* or *horizontal* without causing any difference in the results.

It will be recollected, that it is proposed to dispense with the packing rings, when the engine is applied as a water-mill. It becomes, therefore, a matter of importance to ascertain what quantity of water will in consequence be lost. Let us for this purpose suppose the engine to work under a column of 30 feet. It may at first sight occur to the reader, that the sectional areas of *all the leaks* added together, and multiplied by the velocity produced by 30 feet pressure would show the quantity wasted. But the fact is not so; for the water in its escape, must first pass into the spaces behind the cone, and the plane, before it can get into the waste aperture; hence there will be but 15 feet pressure to force the water into those spaces, and an equal pressure only to force it *to the waste aperture*, to say nothing of the resistance caused by the constant current there. Now, 15 feet head of water will produce 206 feet velocity per second, which is three times the speed of the wing; hence, the proportion which the surface of the wing bears to three times the areas of the leaks, will be equal to the proportion between the quantities of water used and wasted; an amount altogether trifling—since there need be no more space round the cone or plane than will ensure a free action, and that space will never increase, for where is no touch there can be no wear.

From the description that has been given, it may reasonably be inferred, that pumps, on a similar construction, would answer well. It seems also well calculated to supply what has been long a *desideratum*, namely, an apparatus which shall give a steady and powerful blast for smelting purposes, without being either of complex construction or of unwieldy dimensions.

Sir,—Notwithstanding your correspondent "Mechanicus" has offered a *reply* to my remarks (see pages 420 and 421, vol. xvii.) on Mr. Ericsson's ingenious machine, I submit to your intelligent and reflecting readers that my observations remain *unanswered*. But you must allow me to remind them, that in

my communication of the 22nd ult, I merely professed to show certain "circumstances attending the working of this new engine not pointed out in the description." I did not *presume* to estimate the amount of effect, beneficial or injurious, resulting from any of those circumstances, except where it was obviously demonstrable, it cannot, therefore, be said that I have overrated them. Thus,

In the first article, I said there *must* a *grinding* between the cone and plane, and it is admitted that there is; but the term "friction" is preferred—this is a point of little moment, although I still think the word I have used is more expressive of the peculiar nature of the action, and therefore more appropriate.

Secondly—I said there must be a powerful disposition to tilt, or separate the cone and plane obliquely, and it is admitted that there is; but it is said that such tendency *may* be counteracted by admitting steam into the vacuity between the dome and plane, and also under the cone; your correspondent having overlooked the fact, that the elastic pressure of steam so admitted would then merely *reverse the operation*, and press the plane down upon the cone, and the cone upwards to the plane, with a power varying (in an engine of 39 inches diameter, and steam at 45 lbs. per square inch, as instanced) from 13,333 lbs. to 40,000. There would *then* be an *equal* but *reversed* disposition to tilt the plane and cone; the partial lateral pressure upon the packings or axles must *then* take place to the exact degree I have before shown, though in *opposite* directions, while the grinding (or friction) of the cone and plane at the radius of contact will take place under a pressure fluctuating between 13,333 and 40,000 lbs. This, it will be perceived, is a matter of calculation founded on data wholly furnished by the original description.

Third—The statement, that *some part* of the packing at the edges of the wings *is* always in contact with the interior of the chamber, is no answer to the statement of the fact, that *some other part is not* always in such contact, and, consequently, that an *unequal* wear is unavoidable to the injury of the whole packing.

Fourth—I must again assert, that the packings V V will be particularly liable to injury; for, independently of the peculiar action of the wings against them, under great pressure (particularly if steam be admitted between the dome and plane) there will be a constant alternating action of the packings in the direction of the plane in consequence of the varying width of the slits, resulting from the ultimately horizontal and oblique position in which each of the vanes is embraced, *twice*, by those packings in performing each revolution.

Fifth—It is admitted, as I have said, that a fly wheel *is* indispensable, except as I have excepted, but that it is far from objectionable. I have not said that it is objectionable, though it would certainly be an incumbrance; *but it forms no part of the machine, as described.* The back-lash, I have thought, on further reflection, might not take place at the pinion P under a slow motion; but in case of a rapid action, it certainly would. either there, *or at the packing of the vanes*, as the plane and cone *must* have a relatively accelerated and retarded angular inter-motion twice in each revolution, as in the case of the two revolving axles of *Hooke's universal joint;* and, I apprehend, a back-lash upon the packing V, would be even more injurious than at the pinion P.

Sixth—If your correspondent had ever made the experiment, he would have found how very inadequately he has estimated the difficulty of making an angular steam-tight meeting of distinct packings having motions one upon the other—the ordinary junctions of the separate parts of common cylindrical packings having no analogy to the case in question.

Seventh—The only proper mode of comparing the friction of Mr. Ericsson's present engine, his former engine, or any other rotary engine, with that of a common high-pressure engine, is, first by supposing them of equal powers, and to work at the same pace; whence it follows that if, *working at the same pace*, the friction of the one surpasses that of the other eight-fold, the friction of the one must be eight times that of the other; and if the velocity of the new engine be increased to obtain more power within a given compass, the friction must at the same time be increased; thus the comparative ratio of excessive friction will remain unaltered. I repeat, therefore, that

the *quantity of rubbing*, estimated by the elements of *force*, *surface*, and *velocity* accurately taken, will be found in Mr. Ericsson's new engine to be at least eight times that of an ordinary high-pressure engine *of equal power:* should any of your readers doubt the statement, let them make the calculation from the data to be discovered by a careful investigation of the machine, as described in the specification.

Eighth—The opinion of your correspondent seems to be that a packing *may* be found to bear a friction of 20 miles an hour. I have not had, nor have I, the temerity to venture an opinion on that point, and would merely suggest, that in such extreme cases, no test is so proper or convincing as that of *actual experiment*. I have said that rapidity of action is a quality appertaining *generally* to practicable rotary steam-engines, and it is so undeniably; I did not, and I do not, profess to determine *which* of the numerous contrivances to that end shall be considered *practicable* or *impracticable;* but "Mechanicus" has, I think, rather unceremoniously, in his concluding sentence, consigned Mr. Ericsson's *former* patented rotary engine to the "Tomb of the Capulets."

I have not offered any separate reply to the Editor's remarks; not, I beg to assure him, from any feeling of disrespect, but because from the peculiar nature of those remarks, the answer is necessarily embodied in the above.

I am, Sir,

Your very obedient servant,

C. A. Busby.

Stanhope-place, Brunswick-terrace, Brighton.
October 6, 1832.

Sir,—I observe, by your last week's Number, that you do not consider the first part of my reply to Mr. Busby's objections against Mr. Ericsson's steam-engine as satisfactory.

Mr. Busby stated, that the oblique plane was exposed to a pressure of 40,000 lbs.; this assertion I called a "gross mistake," and I considered all demonstration unnecessary, it being evident that steam "might" find its way behind and cause counter-pressure; but since it would puzzle my ingenuity to *prevent* the steam from entering behind the cone and plane whilst there is a free action between the packing-rings and the chamber, I can now add nothing to make the subject clearer than by substituting the term *will* for might.

I also notice that Mr. Busby has taken the trouble to elucidate his first assertion of the "quantity of rubbing surface" being "*eightfold*," and which he this time confounds with "eightfold friction of the *engine*," without, however, attending to any thing but the *packings*. The whole comparison, as I stated before, leads to no conclusion, being false in principle; but the improvement from "8 times" to "9½ times" (friction), calls for this remark, that Mr. Busby in making the improvement has overlooked the circumstance that the motion between the wings and the 4 straight packings is barely perceptible towards the centre, and towards the chamber only one quarter of the velocity of the packing-rings.

Mr. Busby's conclusion, that in a hydraulic-engine the *leakages* "would, of course, be 9½ times that of an unpacked piston," carries with it such an importance, that its fallacy must be thoroughly explained. The statement that the circumference of the cone and plane together with the length of the 6 packings $=9\frac{1}{2}$ times the circumference of a $3\frac{5}{8}$ inch piston, is quite correct; but the weighty fact is overlooked, that just as the wings have *passed* their horizontal position there is only *one-fourth* of the circumferences of the cone and plane, only *one-half* of *one* of the edge-packings, and only *one* packing in the plane exposed to leakage! Now this will at once bring the mean of the asserted leak from $9\frac{1}{2}$ to $4\frac{3}{8}$; but the water which has "leaked" behind the cone and plane must *get away*, else there would be no leak at all, and this will require about an equal force to that which causes the leak in the first instance; hence it becomes evident, that instead of "9" there will be only $2\frac{3}{8}$ times the leak, compared to the "unpacked piston"—thus much for the accuracy of the calculation. But who would ever think of driving a piston back and forwards by means of water, at the same rate with this water-mill? The least reflection as to the specific gravity of water, and the fact that two cylinder contents required to be *checked* and *put in motion*, passing the valves and passages four times during each revolution of the engine, shows how useless the comparison is altogether.

In your reply, Mr. Editor, to Mr. Murdoch's objections, it appears you have not noticed the "acute cones" of the shaft, which, according to his views, will cause such a "very great friction." Now, were it not the fact that steam will find its way behind the cone, I should be for *reversing* those "acute cones" to prevent such a calamity as the apprehended jambing of the shaft.

There is, also, another objection of Mr. Murdoch's unnoticed—an objection which, indeed, sounds very important—viz. "the force to cause leakage and friction is 9 times as great as the working-power;" this statement, in the first instance, is incorrect, for the separating force (if there were no counteraction) would at one period of the revolution be only three times; the mean should, therefore, be taken, which is *six* instead of "nine times the working-power causing friction." But the complete fallacy of drawing conclusions as to the utility of an engine from *such a fact*, will be seen at one glance by estimating the frictions of the ordinary steam-engine in a similar manner—a marine-engine, for instance. Suppose its piston exposed to any given force, say 10,000 lbs.—it then becomes evident, that 10,000 lbs. will be at work, "causing friction," where the side-rods are coupled to the cross-head—likewise 10,000 lbs. where the side-rods are attached to the beams—these being what are called equal, there will be 20,000 lbs., causing friction in their axles—then 10,000 lbs. where the connecting-rod joins the beams—then 10,000 lbs. in the crank-pin—and, lastly, 10,000 lbs., causing friction in the crank-shaft bearing—in all 70,000 lbs.! thus *seven times* "the working-power causing friction?" But are we any the wiser for knowing this? Can we judge by this what diminution of power is caused in consequence? Certainly not; the speed of the rubbing surfaces, multiplied by the force which they sustain, can only determine the amount of the loss.

I am sorry to intrude on your columns to such an extent, but the nature of the mis-statements and erroneous conclusions put forth has not admitted of a shorter refutation.

Your most obedient servant,

MECHANICUS.

London, Oct. 9, 1832.

[We have received a letter from Mr. Ericsson himself, in which he states that he is preparing a treatise on his new engine, in which all the points about which there are any doubts, will be fully cleared up.—ED. M. M.]

THE ROSS EXPEDITION.

Dear Sir.—I have read with much pleasure the forcible appeal of my old antagonist—friend, I may call him, "Aurum," on the subject of the Government grant of £2,000, proposed to be advanced towards the fitting out an expedition to discover, if possible, the fate of Captain Ross and his companions. It is no more than just, that such an expedition should immediately be sent forth; it is a duty incumbent on the country so to do, not only for the sake of the gallant adventurers, but as an example to after-enterprising men, that they may know that they will not be forgotten when they leave their native shores, on enterprises, calculated, if successful, to redound not only to the glory of their skill, and the good of science, but also to the general benefit of their country. It is a shame, indeed, that such an undertaking has not before now been carried into effect. When I remember how bountifully a certain scheme—a wild, interested, visionary scheme—to trade round the world, was supported a year or two ago by the wealth of the rich and benevolent, and patronised and encouraged by the names and advocacy of the great and learned, I cannot for a moment suppose that this expedition will be suffered to drop for want of money. It would be an eternal blot on the humanity of Englishmen, were it allowed to escape their regard; and, I think with "Aurum," that the Committee of Captain Ross are doing a wrong to the kind sympathy of the country, in holding back (as it would seem) from the course recommended to them.

I would suggest, too, that as the trading voyage round the world, to which I have just alluded, has been given up—for its projector is busy now with the scheme of getting into Parliament,—the funds, if any, should be appropriated to this higher object. The consent of the subscribers could doubtless be obtained for this purpose; and, I am sure the chivalrous spirit of disinterested generosity, which so pervades all the public professions of the ingenious proposer of that expedition, is a sufficient guarantee to the world, that *he* will throw all the aid he can into the scale, to bring about a consummation so devoutly to be wished.

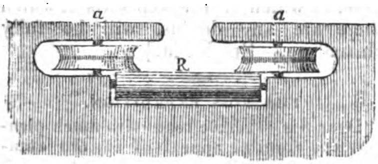
I am, dear Sir,

Very truly yours,

T. M. B.

October 5, 1832.

IMPROVED LEADING BLOCKS.



Sir,—On examining some "leading-blocks," as they are technically called, a short time since, I was struck with the appearances which many of them presented. In some, the pulley had set fast, and one side had been cut into by the rope, while in all, the way between the pulley was cut into deep grooves; evidently showing the existence of great mechanical disadvantage, where the reverse would have been highly desirable.

It occurred to me at the time, that a little addition would make a great improvement in this useful machine; and I send a sketch of a method of construction that would be found very much superior to those at present employed.

The annexed sketch represents the side of a ship, or dock, &c. &c.; *a a* are two gun-metal sheaves, turning on iron axes, and having more end play than is usual. The sheaves rest upon a metal roller R, which runs freely upon an iron axis.

The roller should be closed in, about half-way up, both on the outside and within.* The framing of the block should be lined with iron, and the whole kept well greased, to reduce the friction and prevent corrosion. With this form of block, the friction—and consequently the labour, as well as the wear and tear of ropes, would be greatly reduced.

For, if the rope happened not to run against either of the sheaves, it would still work upon the roller, where motion would be almost as free. If the rope took into a sheave, that and the roller would turn together; the other sheave would be at liberty to turn with the roller, the friction between them most likely being sufficient to communicate motion.

The increased efficiency and durability of these blocks, would amply repay the additional expenses of construction.

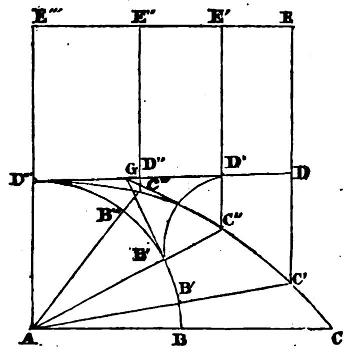
Yours, respectfully,

W. BADDELEY.

London, Sept. 27, 1832.

* Omitted in the sketch for the sake of distinctness, nor is it absolutely necessary.

SOLUTION OF THE 7TH MATHEMATICAL QUESTION, VOL. XVI. P. 187.



Question.—Let AB be a horizontal plane, and conceive it to be turned round the point A into the different positions AB′, AB″, &c. so that the lines AB, AB′, AB″, in this moving plane shall be all in a vertical plane passing through AB. Now, suppose a ball to be projected from the point A with a given velocity, and with an elevation such as to send it to the greatest possible distance C, in the plane AB; and suppose other balls of the same weight are projected from the point A with equal velocities, and at such elevations as to carry them to the greatest possible distances on the planes AB, AB′, &c. as the points C′, C″, &c. It is required to determine the curve which is the locus of the points C, C′, C″, &c. abstracting from the resistance of the air.

Solution by a Westminster Scholar.

Draw AD‴ perpendicular to AB, and make AD‴ = impetus due to the common velocity. From the centre A, and distance AD‴, describe the circle D‴, B‴, B″, B′, B. Then, by the theory of projectiles, all the parabolas that can pass through the point A, having the impetus AD‴, the locus of all their foci will be the circumference of the circle D‴, B‴, B″, B′, B. Draw the directrix D‴, D, and suppose AC″ to be the greatest range on the inclined plane AC″. Draw C″ D′ perpendicular to D‴ D; from the centre C″, and distance C″ D, describe a circle D′ B″; then if this circle just touch the circle D‴, B′, B, it is demonstrated by the writers on projectiles, that AC″ will be the greatest possible range. Hence, from the point B″, draw B″ G, touching the circle D‴, B′, B, and meet-

ing the directrix in G; bisect the angle B″, G, D′, by the straight line G C″, meeting AC″ in C″; then, evidently C″ D′=C″ B″, and C″ B″ G, being a right angle, the two circles touch one another in the point B″; produce C″ D′, to E′, making D′ E′=A B″.·.AC″=C″ E′; through E draw E‴ E parallel to D‴ D, and suppose the points C′ and C‴ to be the greatest ranges on the planes AC′, AC‴, and drawing C′E, C‴ E′, parallel to C″ E, it may be demonstrated in the same way that AC′= C′E, and AC‴=C‴E″. Hence, the locus of the point C, C′, C″, &c. is a parabola, whose focus is A, and directrix E‴ E.

["Iver Maciver" will not be offended that we have been led by a desire of encouraging the talent displayed by our young "Westminster" friend, to give the preceding solution a place in preference to the equally correct, and, perhaps, more elegant one with which he has favoured us. We have received solutions from three other quarters, but they are all very erroneous.—Ed. M. M.]

SAIL-WORKED PADDLES.

Sir,—Believing it possible to show the inefficiency of any modification of the windmill to propel a vessel by paddle-wheels, I of course do not agree with Junius Redivivus (page 395, vol. 16), when he says, "let the matter be put to trial without any farther contest," &c. For this I do not see the least occasion. A preliminary discussion in the Mech. Mag. has often doubtless superseded the necessity of incurring the serious expense of experimenting (to do which satisfactorily is sometimes attended with ruinous consequences), and why not in the present instance? For my part, I shall always think the pages devoted to free discussion amongst the most useful in your work. These considerations, together with A. B. W.'s second paper, page 435, vol. 16, wherein (without noticing, much less attending to the advice I gave, page 240, vol. 16), he still persists in asserting the great utility, as well as the practicability of his scheme, have induced me again to trouble you on this subject.

1st. The power of a windmill arising wholly from the resistance opposed by the sails to the action of the wind, must ever vary with the motion of the vessel.

2nd.—Therefore, on a vessel's going before the wind, the power of the mill will decrease in a certain ratio as the rate of the vessel increases; for, if it is blowing a very brisk gale, the velocity of which, according to Smeaton, is twenty miles an hour, its force will be equal to two pounds on every square foot of fixed surface, against which it acts perpendicularly; but if the opposing surface or mill sails travel with the wind, and at half its velocity, or ten miles an hour, the effective force will be reduced to half a pound on each square foot.

3rd.—Let no one, therefore, imagine, that going against the wind would be attended with any better success; for, although it is quite certain that its force would increase in the same ratio with which it decreased in the first case, as the velocity increased with which the opposing surface meets the wind; yet where is the power that must give motion to the vessel against the wind? Certainly not in the mill; for let its diameter and height be ever so great, A. B. W. himself admits, that the effective surface for giving motion to the machinery, must necessarily be less than half the diameter multiplied by its whole height, while the surface exposed to the action of the wind, and consequently opposing the motion of the vessel, will be the whole diameter multiplied by the whole height, that is more than two to one against the vessel's sailing in the wind's eye.

4th.—A wind at right angles to the course of the vessel, is apparently what would be most effective in working the machinery: but as a cylinder always opposes an equal surface to the wind from whatever quarter it may blow, there can be no doubt but the lee-way must destroy the advantages a side-wind at first appears to have, over those which blow directly fore and aft.

In stating the comparative efficacy of the wind on sails in the ordinary way, and the wind on mill sails, A. B. W. has been led, or rather misled, by noticing the power of stationary mills, and says, "in this the pressure is applied to a lever of the greatest effect." I will conclude, by trying how far facts will support this statement. He gives the mill as the frustrum of a cone, the mean diameter of which we may take at seven and a half

feet; then, as I should suppose, he would not think of applying paddle-wheels of a less diameter than ten feet, the leverage is clearly against him in the proportion of four to three. With respect to velocity, A. B. W., as I said before, is still further out, for wheels of ten feet diameter should make about forty revolutions instead of ten; thus again reducing the power arm of the lever three-fourths, and, together, making his lever of greatest effect, in the numerical ratio of sixteen to three against him.

Yours, respectfully,

TREBOR VALENTINE.

Derby, Sept. 25, 1832.

SAFETY VALVES.

Sir,—A short time since I happened to open the safety valve of a steam-engine boiler, when I observed that the float lowered from $2\frac{1}{2}$ to 3 inches, but that when I closed the valve, it rose again. As I could not understand the why and wherefore, I returned when the engine had done work. There was a good fire under the boiler, and steam equal to three or three and a half pounds per square inch. I repeatedly lifted the valve, and invariably with the same effect. I then kept the valve open until the force of the steam was entirely spent when the float gradually rose to its original height.

I hope some of your readers may feel sufficient interest in every thing connected with the steam-engine, to give an explanation of this phenomenon; but as circumstances may cause some variation in the effect produced, I will just add, that the boiler (a wrought-iron one) is of the waggon form, eight feet long, and four feet wide, with the float suspended in the centre, and the safety-valve loaded to 4 lbs. on the inch.

I remain, Sir,

Yours, respectfully,

TREBOR VALENTINE.

[A similar observation to the preceding is to be found among the communications to the Franklin Institute on the subject of explosions. A Mr. Halderman says, "I know it to be a fact from experience, that water will rise up in a boiler when the safety-valve is opened; for not long since, as I was running an engine, finding that the force pump refused to supply the boilers, I immediately stopped and damped the fire, and, upon examination, I found that the water had sunk below the lower gauge cocks, which are generally situated about two inches above the flues in the end of the boiler. By backing the safety-valve for a few seconds, I found that the water rose up flush with the gauge cocks, and by closing the valve, the water again sunk."—*Journal of the Franklin Institute*, vol. ix. page 27.—Mr. Halderman ascribes the rise of the water to its "being suddenly relieved from the pressure upon "its surface."—Ed. M. M.]

REPORT OF THE FRENCH BOARD OF LONGITUDE ON THE APPROACHING COMET.

(Continued from last Number, p. 15.)

This result was adopted at once, for in 1826 philosophers had completely abandoned the old notion, that the revolutions of comets must be, of necessity, of very great length and duration. However, after the example of the comet of 1770, it would have been hazardous to predict the future re-appearance of this heavenly body, before calculating all the derangements which it might suffer from different planets; our colleague, M. Damoiseau, therefore undertook this long and minute calculation, and the result was, that the comet of $6\frac{3}{4}$ years will cross the plane of the ecliptic, that is, the plane in which the earth moves, on the 29th October, 1832, before midnight. Now, as the earth during its course round the sun never quits the plane of the ecliptic, it is in that plane alone that a comet can strike against it, so that, whatever dangers we may have to fear from the comet in question, will be on the 29th of next October, before midnight.

The next consideration is—will this comet, when it crosses the plane of the ecliptic, pass near, or over any part of the earth's *orbit*, for this it must do to cause any mischief.

On this point, M. Damoiseau's calculations show us that the comet will cross the plane of the ecliptic *a little within our orbit*, and at such a distance from it as is equal to four radii and 2-3ds of our globe; and, we may say, that this small distance *may disappear entirely*, if the elements given by M. Damoiseau be submitted to certain minute variations, which it would not be easy to account for, or remove.

Let us take, however, the distance of four radii and $\frac{2}{3}$ as the real and true distance: We must recollect that this distance is measured from the centre of the comet, and then let us consider whether or no the dimensions of this body be sufficiently

great for some part of it to overlap or lie on our orbit.

The observations made by the celebrated M. Olbers, of Bremen, on this comet in 1805, gave for the length of its radius (or semi-diameter) five radii and 1-3d of our globe; and as we have just seen that the centre of the comet will be only four radii and two-thirds of the earth from her orbit, *it results clearly that a portion of the earth's orbit will, on the 29th of next October, be comprehended or enveloped within the nebulosity of the comet.*

There remains now only one more question, which is, where, that is, in what part of its orbit, will the earth be at the moment when the nebulosity of the comet rests upon, or embraces, a part of that orrbit?

The answer is, the earth will not arrive at that point of its orbit which will be enveloped in the nebulosity of the comet on the 29th of October, until the 30th of November following, that is, rather more than a month afterwards. We have now only to take the mean rate at which the earth travels through its orbit, and this being 674,000 leagues per diem, each league may be taken at about 2¼ English miles; a simple calculation will prove, that *the comet of 6¾ years will, at all times of its appearance in* 1832, *be at more than* 20,000,000 *of leagues from the earth.* But if, instead of crossing the ecliptic on the 29th of October, this comet were to arrive on the 30th of November, it would infallibly mix its atmosphere with ours, and, perhaps, even it would strike against us; but I hasten to say, that an error of a month in the calculated arrival of a comet at a given point is not possible.*

The reader now knows all that can interest him as to the route of the comet in the month of October, 1832. The results which I have given are the same as those which M. Olbers gave in a note, and on which the public, as well as the writers in newspapers, have fallen into such mistakes. I hope I shall be more fortunate, and not be misunderstood. But there are still people who, admitting that the earth will not receive a *direct shock* from the comet in October next, believe that it cannot touch our orbit without altering the form of it; as if that orbit were a material substance—as if, in short, the parabolic flight of a shell from a mortar could be affected by passing through a space which had been antecedently traversed by other shells.†

9. On the effect of the resistance of the ether in space, on the route of comets.

Hitherto the routes or courses of planets have agreed exactly with the astronomical tables which have been founded on the supposition that their motion was performed in a perfect vacuum.

The course of the "Comet of the Short Period" (Encke's) has just shown us that a new element must be taken into consideration as regards comets—I allude to the resistance which a gaseous substance of great rarity which fills space, and which it has been agreed to call "ether," opposes to the movements of bodies traversing it.

This resistance produces no sensible effect on planets, on account of their density; but comets being generally little more than aggregations of light vapours, are sensibly retarded by this ether.

In calculating the positions in which "the Comet of the Short Period" should be found in 1822, 1825, and 1829, M. Encke strictly calculated the derangements it would suffer from the action of planets: nevertheless, at each re-appearance of this comet, there was a difference between calculation and observation, and always on the same side. The cause of these discordances could be found only in the supposed resistance of the ether; and M. Encke has shown this resistance to amount to about two days in each revolution. If this influence on the comet of 6¾ years were of the same description, it would not affect essentially the results at which we lately arrived as to the results of the minimum of the comet's distance from the earth in 1832.

I might have omitted noticing this new cause of perturbation, but I have spoken of it because certain uneasy people have seized on this resistance of the ether to come to the conclusion, that the momen of the comet's passage through the plane of the ecliptic could not be predicted with certainty; but I will develope this objection in all its force. The comet, if moving in a vacuum, would arrive at a point of our orbit 31 days *before* the earth; but the natural effect of resistance would be to retard, and as the comet moves in ether, it ought to arrive on our orbit *later* than was indicated, and hence its distance from the earth will be *less* than was calculated. But let us go straight to the point; according to the objection made,

* M. Arago must be taken, I suppose, at his word here; but he has shown us before, the powerful and unexpected effects planetary perturbations have had both in lengthening and shortening cometary revolutions. Why, then, is the 6¾ years' comet to be exempt?—Tr.

† With much deference to M. Arago's great talents, this is *not* an illustration in point. The shells *have* passed—are gone, but the earth is near, and in her orbit. The fears entertained are *not* that the orbit will be acted on as a mere orbit, but that the orbit will be acted on by the effects produced on *the earth* by the comet, and hence a change in the orbit.—Tr.

the *real* position of the comet would be less advanced than its *calculated* position. What, however, were the facts in the instance of Encke's comet? Why, on its three appearances in 1822, 1825, and 1829, the *real* comet always *preceded* the *theoretical* or *calculated* comet.

There is, therefore, no longer any question as to the comet of 6$\frac{2}{3}$ years passing the plane of the ecliptic *later* than was at first calculated. If this comet is governed by the same principles as the comet of Encke, its passage over our orbit must be *hastened*, and the minimum of the earth's distance would be increased in proportion. I confess that at first sight this acceleration may appear strange, and one would think that a medium which resists could only retard; but this difficulty ceases on our reflecting that the immediate effect of a resisting medium on a body moving in it is to diminish its centrifugal force, which is just the same as if the attractive force of the sun increased. An increase of this force naturally draws the moving body nearer to the sun, and every one knows that the nearer a celestial body approaches the sun in its orbit, it moves so much the quicker.

10. Will this comet have any serious effect on the seasons of 1832.

This query will, no doubt, awaken the recollection of the grand comet of 1811, which year was so renowned for its vintage, that wines made in 1811 were called "comet wines." I know that there are strong prejudices against me, but I will say, that neither the comet of 1811, nor any other comet, has ever had the slightest effect on our seasons. I will begin with facts.—Comets, people tell us, warm our globe by their presence. Do they? Nothing is more easy than to refer to the thermometers kept in the different observatories of Europe. Let us take that of Paris, and we shall find the fact, that the medium temperatures of the years most noted for comets is less than those of the years in which no comets have appeared. [A table is here given, which establishes this fact.] One may here remark, in passing, that the year 1805, with its two comets, was a year in which the medium temperature was low compared with other years; that 1808 may be reckoned amongst the cold years, although few years have produced so many comets; that the coldest year in the table was 1829, in which a comet appeared; and that the year 1831, in which there was no comet, enjoyed a much higher temperature than 1819, when there were three comets, one of which was very brilliant.

With these facts before us, we cannot attribute to comets any calorific power, as far as our seasons are concerned. But there are other considerations which we must keep in view. A comet, in passing, can act on the earth in only three manners:—1. By means of attraction; 2. By its luminous and calorific rays, which emanate from it in all directions; or, 3. By the gaseous matter which composes its nebulosity or its tail, and which might fall on our terrestrial atmosphere. This last consideration may be dispensed with as regards the comet of 1832, for it has no tail, and its head will be, as has been shown, at an immense distance from the earth; nor did the tail of the comet of 1811 ever pass over the earth, for, although that tail was 41,000,000 of leagues in length, the comet was never within 47,000,000 of leagues of the earth, and accurate experiments proved that the maximum of light which the comet of 1811 shed upon the earth was not equal to one-tenth of the light of the moon, and when concentrated did not produce the slightest effect on the blackened bulb of the most sensitive thermometer.

It is, then, to the attractive force of comets that we must look for their supposed meteorological influence.

Here the moon will serve as a point of comparison. The moon causes the tides of the ocean: mathematically speaking, the comet of 1811 ought to have produced analogous tides, but as no one observed any such tides, we must admit that they did not amount to any appreciable quantity. But the height of a tide is proportioned to the attractive power. We know that the lunar tides are very great, and the cometary tides, if any, are insensible; hence it is clear, that the cometary action on the earth bears no proportion to that of the moon; and as to any calorific effects of the great comet of 1811, the most delicate instruments have not shown their existence. Can, then, the wine-growers expect any result from the comet of 1832?

(To be continued.)

NEW PUBLICATIONS CONNECTED WITH THE ARTS AND SCIENCES.

DONOVAN'S CHEMISTRY.

After a tolerably long inter-regnum, Dr. Lardner has recommenced the scientific series of his Cabinet Cyclopædia with a treatise on one of the most important and interesting of all the sciences:—Chemistry;* which has been contributed

* A Treatise on Chemistry, by Michael Donovan, M. R. I. A. (Cabinet Cyclopædia, vol. 34). London, 1832. Longman and Co. Small 8vo. pp. 407.

by the author of the volume on Domestic Economy — some of the speculations broached in which afforded the critics matter for a little good-natured merriment at his expense. Mr. Donovan appears to be of rather too speculative a turn altogether; he seems to delight much more in roaming at large amongst the enchanting wilds of theory, than in plodding through the well-worn paths of mere matter-of-fact. In his present production, although he regrets that his limits are too small to allow him to bring his readers acquainted—except very superficially—with more than one-half of the whole number of metals; he yet succeeds in finding room enough to favour them, at pretty considerable length, with his own ideas and opinions on every point of the atomic theory, and other controversial questions, of but little direct practical use to the tyro in the science, especially as nothing determinate is after all deduced. Such speculative matters as these might have been advantageously postponed altogether to a more advanced stage of the chemical series,—and room enough would have been thus gained for greater circumstantiality in that division of the work which treats of the "Arrangement and Examination of the Materials of Creation;" the meagreness of which, as matters stand, is only excused by the author's apology on the score of narrow limits.

There would still have been quite enough of theory left for one small volume—the introductory part, or "General Survey of Creation," necessarily including much matter of a speculative description, mixed of course with "sterner stuff." As a specimen of the latter, we extract a portion of the chapter on "Affinities," in which a number of striking instances are brought forward with effect, although not all for the first time:—

"The change of properties which takes place when chemical attraction acts, is not confined to metals, but is a general result in every case where different bodies are brought into this state of combination or chemical union. Frequently we find that the properties of each body are totally changed; and that substances, from being energetic and violent in their nature, become inert and harmless,—and *vice versa*. For instance, that useful and agreeable substance, culinary salt, which is not only harmless but wholesome, and absolutely necessary to the well-being of man, is composed of two formidable ingredients, either of which, taken into the stomach, proves fatal to life; one of these is a metal, and the other an air; the former is called *sodium*, the latter *chlorine*. When presented to each other, the violence of their nature is manifested by their immediately bursting out into flame, and instantly they are both deprived of their violence. Can any thing be more striking than the change of properties in this case; and who could have supposed that culinary salt is composed of a metal united to an air? The medicine called Glauber's salt, is another instance; it is composed of two caustic poisons of different kinds; one called oil of vitriol, and the other barilla or soda. There are also two substances known to chemists, which are disgustingly bitter liquids; one is called nitrate of silver, and the other hyposulphate of soda; when mixed, they form a compound of considerable sweetness. But the atmosphere which we breathe is the most extraordinary of all instances: it must be surprising to those who are unacquainted with the fact, that atmospheric air, indispensable as it is to life, is composed of the same ingredients as that most violent and destructive liquid called *aqua fortis*, or nitric acid. This powerful acid, by being made to act upon sugar, the sweetest of all things, produces a substance intensely bitter to the taste. Charcoal is, of all substances, the most difficult to convert into vapour; so much so, that the conversion has never yet been decidedly effected; it is also a very solid substance; and diamond, which is nothing but crystallized charcoal, is one of the hardest bodies in nature. Sulphur, in the solid state, is also a solid substance, and to hold it in vapour requires a high temperature. But when these two substances, carbon and sulphur, are made to combine chemically, so as to form the substance called bisulphuret of carbon— their properties are strikingly changed. Instead of the compound being hard, it is a thin liquid, and is not known to freeze or solidify at any degree of cold that can be produced. Instead of the compound being difficult to vaporize, it is of all liquids one of the most evaporable. Charcoal is the blackest substance with which we are acquainted; sulphur is of a most lively yellow hue; but the compound is as colourless as water. A new smell and taste are acquired, and, in a word, there is not one point of resemblance with the component. These facts are strikingly illustrative of the change of properties which follows on the exertion

of chemical attraction between the ultimate particles of bodies."—page 25.

Rather to our surprise, Mr. Donovan takes occasion, when noticing the carbonates, to acknowledge that "the necessity of reform in the existing nomenclature of the science" is "conspicuous." It is high time, indeed, that some alteration should be introduced, for it appears that, setting aside the barbarism of the six-feet-long jaw-breaking compounds of which the "nomenclature" is composed, the said jaw-breaking compounds are totally inefficient to express precisely many of the chemical mixtures, which stand as much in need as ever of an exact designation. Our author is for remedying the inconvenience from the old source, and proposes to introduce a new set of unpronounceable words; hinting, by way of feeler, at the propriety of christening a certain mixture by the euphonious appellation of "sescuplocarburet of hydrogen!" This is "reform" with a vengeance! Why did not Mr. D. attempt at once to *grow* the word required from an English root, so as to be at any rate a little less uncouth and a little more expressive? He does indeed venture in an *aside* to tell us that he means to express "one-and-a-half-fold carburet," which does not come very "trippingly off the tongue" to be sure, but yet conveys a little meaning along with its harshness. In another encounter, plain English does not come off much better; "twofold carburet" (there might and ought to be a plainer word for the latter) is at least as elegant and excellent a phrase as "duplocarburet,"—the one patronised by our author. His mind seems strangely to misgive him now and then when he is making use of the unintelligible gibberish of his craft; we have caught him explaining the pleasing epithet "anhydrous," by subjoining a modest note, in small print (a sort of whisper, not to be overheard by the scientific), "that is, *without water!*" What would Dr. Lardner have done, had he boldly written "*waterless*" at once *in the text!*

Among that half of the metals which *is* described by Mr. Donovan, iron holds one of the highest places: his account of it contains a good deal in a small space:

"We now come to consider a metal with which none can compare in point of real utility, and, fortunately, of abundance. Iron is found in almost every mineral production. It is much harder than either of the two preceding metals (gold and silver). Its specific gravity is from 7 to 7.84, and it is, therefore, the lightest of all the useful metals, except tin. It may be drawn out into wires of great fineness; a wire one-tenth of an inch in diameter will support a weight of 450 pounds; hence its tenacity is a little less than that of gold. It is one of the few metals which the magnet attracts; and it readily acquires magnetic properties, which, however, are not permanent. To melt iron requires a very intense heat, much higher than either of the preceding metals, and, indeed, nearly the highest that can be excited in furnaces. When raised to a yellow heat, it becomes very soft, and may then be hammered out into any shape. When the heat is raised to whiteness, it grows so soft as to suffer even a commencement of fusion; for, if two pieces be laid in contact at this temperature, and struck, they unite and form one, the junction being as solid as any other part of the iron. This property of uniting, by hammering at a high heat, is called *welding*. Iron is a very combustible metal; if thrown into a common coal fire, it burns with brilliant scintillations; and a very thin iron wire burns with scintillation in the external flame of a candle.

"Iron, in the purest state in which it occurs in commerce, is called *wrought iron*. If pieces of wrought iron be laid one over another, with intermediate layers of charcoal, and kept at an intense heat for several days, a combination of iron and charcoal will take place, and the result will be *steel*, which every one knows is capable of being made much harder than iron; it is also more sonorous, tenacious, elastic, and ductile, than iron. It is capable of becoming a permanent magnet; iron acquires only a fugitive power.

"Iron is found in all parts of the world. There is scarcely a stone, or a particle of soil, in which it may not be detected. It occurs commonly in a state of oxide, more or less complicated with clay or stones, and other metals; it is thus found in veins, and disseminated in rocks. The sulphuret of iron, called pyrites, is a very common mineral. Iron also occurs in immense masses in such situations as have suggested the idea of their having fallen from the air; they have been called *meteoric iron*. Professor Pallas describes a block of this iron found on the top of a mountain in Siberia; it was said by the inhabitants to have fallen from the sky; it weighed 1,680 Russian pounds (equal to 1,533½ avoirdupois)."—Page 243.

As usual the book is extremely well printed, and excellently "got up" in every way: it will take its place with the rest of the treatises composing the "Cabinet of Natural Philosophy;" but we do not expect that it will be highly distinguished among its fellows.

Guide to the Carpenter's Rule. By Benjamin Bevan, Civil Engineer.

A very necessary pocket companion to the (common) carpenter's rule, abridged from the larger and well-known Treatise on the Slide Rule, by the same author, but divested of its elaborate formulæ. The exemplifications are all very judiciously selected; the form convenient; and the price cheap.

Loudon's Encyclopædia of Cottage, Farm, and Villa Architecture. Part V.

The favourable opinion we entertain of this work is already on record. The present part contains 12 lithographic plates, nearly 250 engravings on wood, and 5 sheets of letter-press; quantity enough, in all conscience, for the money (5s.) We must, however, as sincere friends to the undertaking, and honest admirers of the utilitarian spirit of the author, repeat a question which we hear on all hands—"What have tables, chairs, stools, cupboards, wardrobes, &c., to do with Cottage, Farm, or Villa *Architecture*?" The value of the information afforded is not disputed; but people do not like to see a book swelled out by matter which has nothing to do with it.

The British Cyclopædia of Arts, Sciences, Manufactures, and Commerce. By Chas. F. Partington, Esq. Nos. I. and II. Division. I. Arts and Sciences.

The *Twopenny* Encyclopædia this should have been called—the better to impress on the public mind its most distinguishing feature, as compared with other works of the kind, and more particularly the threatened *Penny* Cyclopædia of the Useful Knowledge Society. Mr. Partington has taken for his basis an English edition now publishing in America, of the celebrated "Conversations-Lexicon" of Germany; and proposes only to make such additions and amendments as may be necessary to adapt it to the existing state of the arts and sciences in this country. The two specimens before us are extremely good; so much so, that we really do not know what they leave to be desired, in point of either quality, quantity, or cheapness. The Useful Knowledge Society—let them do their best—can but *undersell* it; and, in common decency, they ought to forbear. The letter-press is compiled with judgment and care; and the engravings, which are partly on wood and partly on steel, are all in the first style.

ANSWERS TO INQUIRIES.

MAPS.—"C. T. V. is informed that Mr. Wallis, of Skinner-street, Snow-hill, has two maps of the globe, projected from the two poles to the equator; but they are laid down in radiating scores, having been intended to cover a solid polyhedron, 12 inches in diameter, on which the world was to be depicted. —C. A. B."

GUITAR DIVIDING.—We make the following extract from the last No. of the Westminster Review, for the benefit of the correspondent who some time ago sent us an inquiry on this subject, and of other musical amateurs. "The way in which the guitar maker divides the scale of an instrument (12 equal intervals) whatever be the size, is of extreme simplicity. He uses what he calls a compass of division—being a pair of compasses of wood, but with the legs prolonged on the other side of the pivot, as would be done to make a pair of pincers; and the four points are tipped with iron. The two short legs are each an inch long, and the others (to the nearest sixteenth) seventeen inches and thirteen sixteenths, (the true proportion to five places of decimals being that of 17.81718 to 1). He takes the distance from the nut to the bridge, in the long legs of his compasses, and then with the short legs marks off from the nut the place of the first fret; he takes the distance from this fret to the bridge in the long legs as before, and with the short ones marks the distance from the first fret to the second; and so on. On being asked how he secured the exact proportion of the legs, he said he rubbed the iron points upon a stone till the compasses came exactly to the middle of a string at 12 leaps."

MANGEL WURZEL.—We do not know of any book which treats exclusively of the art of brewing from this vegetable; but "J. S." will probably find the instructions given in our 332nd and 351st Nos. quite sufficient for his purpose.

GREEN BRONZE.—"Zamiel" must first bronze in the ordinary way, and, after warming the article over a clear fire till he can scarcely hold it, give it with a camel hair pencil several thin coatings of the following mixture:—an ounce of the best lamp black, and a gill of strong spirit of wine, strained through a fine linen cloth. Let him next polish the article when cold with a soft brush dipped in clear green oil, and finally lay on a coating of yellow lacquer. The depth of the green depends on the number of coatings of the black mixture employed; for a light green two or three will suffice.

BRIDGES.—The question proposed at the end of our last vol., p. 448, has been answered by Mr. Busby, Mr. Davy, Bob Stay, Pit, An Old Architect, The Ghost of Vitruvius, and A. L. L., who all agree in stating, that dry or land arches in the situation of that at the Surrey end of Waterloo Bridge, form no part of the bridge itself. Mr. Busby observes, that "they merely perform the office of an embankment to elevate the road to a level with the summit of the bridge;" and "Pit" illustrates this view of the matter by putting the case, "that instead of the inclined plane in question having been formed on dry arches, it had consisted merely of soil and rubbish."—"Surely no one," he says, "would have then considered it as part of the bridge; and if it would not have been considered so then, why should it be so now?" Mr. Davy holds that "the entire length of a bridge extends no farther than from the back of one abutment to the back of another;" and observes, that "the dry arches of Waterloo, London, and Southwark Bridges, form no support or stay whatever to these structures." Mr. Busby states, however, that

"there *are* particular cases where dry arches do actually form part of a bridge, as in the case of the Pont de Neuilly at Paris;" to which we shall take leave to add, the more familiar case of Hammersmith Bridge, which must (we apprehend) be held to include all within the holdfasts to which the chains are attached.

Surveyorship of the Navy.—We ought to have a regular office of construction, or council of naval architects, which should be composed of the most scientific constructors in the kingdom, who should combine their efforts to produce good models, and to investigate their properties. The immediate objects of such an office of construction have been pointed out by Mr. Henry Chatfield, of his Majesty's Dockyard, Plymouth, in an ably-written pamphlet, entitled "Reflections on the State of British Naval Architecture in 1831." The advantages to be derived from such an union of talent and division of labour are incalculable; and the establishment would be the means of preventing useless expenditure of the public money, as bad ships would not then be built.—*Correspondent United Service Journal.* The chance of bad ships being then built would at least be greatly lessened. The suggestion is an excellent one, and well deserving the attention of a Reforming Administration.

Volcanic Tufa as magnetic as Loudstone.—Scipio Brieslak, of Milan, has, in the *Nuovo Giornale Encyclopedico*, given a particular account of a singular piece of volcanic tufa, which acted on the needle with as much power as the loadstone would have done; and which he imputed either to a stroke of lightning, or its having lain long in one position. It was of a brownish grey colour, heavy, coarse-grained, and porous. When broken, the fragments preserved their power over the needle, but they did not affect each other even when freely suspended; and they would not in any degree attract the smallest particle of iron, not magnetic; thereby demolishing Cavalho's position, "that no instance of a magnet can be produced which had only polarity without the power of attracting ferruginous bodies."—*Unit. Serv. Journal.*

Improvement in Boots and Shoes.—Mr. Benjamin Norris, jun., of Southwark-bridge-road, suggests, that "what is now termed the upper leather of boots and shoes should be made of the cloth rendered water-proof by caoutchouc, with a thin sheet of the composition introduced between the layers of the sole." He thinks that boots and shoes thus made would be "superior for many purposes to those made wholly of leather, inasmuch as they would be rendered as easy to the feet as a list-shoe, and, at the same time, perfectly water-tight."

Representations of Natural Objects.—At a large manufactory of tea-trays, and other articles in papier-maché, at Wolverhampton, a trial was made, a few years ago, to substitute portraits of plants, botanically correct, for the imaginary compositions of flowers and leaves generally used, but the change was found unsatisfactory, as the articles would not sell. The drawing-room walls of the celebrated stock-broker, Goldsmidt, at Morden, were covered with silk, painted with flowers and other objects, which were all drawn and coloured with scientific accuracy. We recollect the principal flower was the Narcissus Fazetta, with its bulb and roots accurately portrayed; but though we admired the figure in a botanical point of view, it gave us no pleasure among other ornaments, because it had no connection with any of them, and did not combine with them in forming a whole.—*Loudon's Ency. Cottage Architecture.* The two cases are not analogous (with all deference be it spoken). A person may justly admire a correct representation of a bulb and root on a tray, which is a common receptacle for roots and fruits of all sorts, and yet have good reason to be offended with the sight of it stuck upon the walls of a drawing-room. People do not usually dig up potatoes and turnips to ornament boudoirs. It is the sense of fitness which decides. We do not, moreover, believe that the portraits of plants on the Wolverhampton trays *were* botanically correct, for we have always observed that if there is one thing more than another which persons of all degrees admire more than another at a Fine Art Exhibition, it is pictures of still life, painted true to nature.

Steam Ship Guns.—H.M. steam-ship, Bee, has been fitted with two guns, one forward before the foremast, an ordinary 32-pounder—and another abaft the mizen-mast, weighing 84 cwt. with a bore 10·02 inches diameter. Each gun is mounted on a slide, which moves on a pivot, so that the gun may be pointed in any direction all round. The velocity of the recoil is restrained by two powerful screws, which press the carriage on the slide with so much force, that although there is a strong breeching, it is rarely, even in the case of the great gun, brought to its full stretch. From experiments made with the great gun at Portsmouth, it appears, that with only a couple of ounces more powder than is required for the charge of the 32-pounder, that is, 10 lbs. 13 oz., it projected a hollow shot, weighing 81 lbs., at a range of 16°, to as great a distance as the 32-pounder, namely, 3850 yards, or two miles 1-5th nearly.

A Lesson to Grinders.—On the 22nd of August, a workman in Danforth's iron-works, at Windsor Locks, Conn., named Orrin Parsons, lost his life in the following sudden and melancholy manner. He had been employed at one of the grindstones, when, having occasion to leave for a short time, he, imprudently, and contrary to the usual practice, left the stone going at full speed. On his return it had acquired such velocity as to cause it to fly to pieces, one of which, weighing about 200 weight, struck the unfortunate man on the side of the head, and instantly deprived him of life.—*American Rail road Journal.*

INTERIM NOTICES.

Mr. Murdoch's reply did not reach us till after our columns were made up for the week; but it shall appear in our next.

We are glad to learn that Mr. Nutt's Book on Bees is in such a state of forwardness that he expects to be ready to deliver it to his subscribers early in November next.

The American Rail-road Journal, noticed in our last, is published at New York—not Baltimore.

"A Westminster Scholar-Secundus" is mistaken;—we shall always be glad to hear from any of his promising fraternity; he will find the (really clever) article he alludes to in our present No.

Mr. J. Hancock—Accepted.

Communications received from N. G. A.—Tranquil—Cordelia—Castor.

ERRATA.

No. 477, page 439, col. 2, line 15, for "ejectment," read "re-enactment."

—— line 35, $1 \div 16\frac{2}{3} = ,060 \times 4 = 240$ pence.

—— line 38, "for the sovereign 122.274," read 123.274.

Page 440, col. 1, line 32, for "Ricardo," read "Ricard."

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

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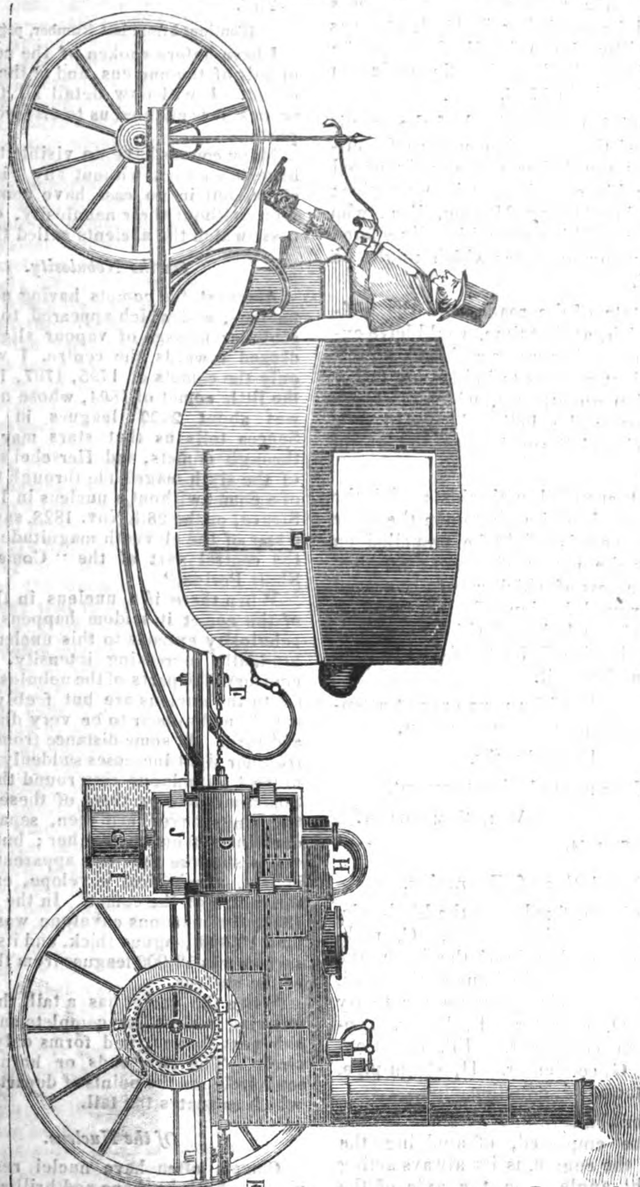


SYMINGTON'S FIRST STEAM CARRIAGE MODEL.

MR. SYMINGTON'S STEAM-CARRIAGE EXPERIMENTS, 1784-86.

Sir,—The drawing now sent represents the model of a steam-carriage, which was invented by my father in 1784, and was exhibited by him to the Professors of the University, and other scientific gentlemen in Edinburgh, in 1786.

The opinion entertained of the practicability of the invention was so favourable, that my father was warmly urged to bring his experiments into practice; and the late Gilbert Meason, Esq., who always proved his patron, liberally offered to defray any expenses which might be incurred.

The state of the roads, and the difficulty which, at that time, would have existed of procuring water and fuel, afforded sufficient reasons to induce my father to abandon an attempt, which, through these causes, he believed, would only have produced disappointment to his kind advisers.

Whilst engaged with this model the idea occurred to him, that upon the same principles vessels might be propelled on water by the power of steam; an idea, the correctness of which was fully proved by the exemplification afforded, in 1788, on Dalswinton Lake, of which exemplification a sketch will be furnished as soon as time will permit.

Feeling obliged by your prompt attention to my former communication,

I remain, Sir,

Your most obedient servant,

WM. SYMINGTON.

Bromley, Sept. 24.

Description of Engraving.

A, the drum, fixed upon the hind-axle. B, tooth and ratchet wheels. C, rack-rods, one on each side of the drum, the alternate action of which, upon the tooth and ratchet wheels, produces the rotary motion. D, cylinder. E, boiler, supplied from condenser. FF, direction-pulleys. G, condenser. H, steam-pipe. I, water-tank. J, eduction-pipe.

A material advantage obtained by the mode here employed, of applying the power of the engine, is its always acting at a right angle upon the axle of the carriage.

REPORT OF THE FRENCH BOARD OF LONGITUDE ON THE COMET OF 1832.

2. *On the Physical Construction of Comets, that is, their Nebulosity, Nucleus, and Tail.*

(Continued from last Number, page 28.)

I have before spoken of the nebulosity or hair of the nucleus, and of the tail of a comet. I will now detail all that telescopes have enabled us to discover of their parts.

Many comets have no visible tail, many have been seen without any visible nucleus, but in no case have comets been seen without their nebulosity, or fogginess, which the ancients called thin hair.

On the Nebulosity.

Amongst the comets having no visible nucleus, and which appeared to be mere globular masses of vapour slightly condensed towards the centre, I will name only the comets of 1795, 1797, 1798, and the little comet of 1804, whose nebulosity was about 2000 leagues in diameter. Seneca tells us that stars may be seen through comets, and Herschel saw a star of the sixth magnitude through the midst of a comet without a nucleus in 1795; and Struve, on the 28th Nov. 1828, saw clearly a star of the eleventh magnitude through the central part of the "Comet of the Short Period."

When there is a nucleus in the centre of the comet it seldom happens that the nebulosity extends to this nucleus, with a gradually increasing intensity. On the contrary, the parts of the nebulosity nearest to the nucleus are but feebly illuminated, and appear to be very diaphanous and rare. At some distance from the centre their light increases suddenly, so as to present a luminous ring round the centre. Sometimes two or three of these concentric rings have been seen, separated by dark lines from each other; but we can easily suppose that this apparent ring is, in fact, a spherical envelope, embracing the centre of the comet. In the comet of 1811, the luminous envelope was not less than 10,000 leagues thick, and its interior surface was 12,000 leagues from the centre of the nucleus.

When the comet has a tail, the luminous ring is closed or complete only on the side next the sun, and forms only a semicircle. The two ends or horns of this semicircle are the points of departure from which emanates the tail.

Of the Nucleus.

Comets often have nuclei resembling planets, both in shape and brilliancy. In general they are only small, but not al-

ways so. The following is a table of the diameters of the nuclei of several comets:

Comet of	1798,	11 leagues.
———	1799,	154 ditto.
2d comet,	1811,	1089 ditto.
Of Dec.	1805,	12 ditto.
———	1807,	222 ditto.

Some astronomers contend that cometary nuclei, even those which, from their brightness, most resemble planets, are completely diaphanous, that comets, in short, are a mere assemblage of vapours. They found this opinion on observations which I do not think conclusive. The question is important; its solution will decide, to a certain degree, the part we may attribute to comets in the revolutions of the physical world.

All comets in their courses traverse successively different constellations. The region in which they move is much nearer to us than the fixed stars; therefore, whenever the nucleus of a comet passes between us and a fixed star, we are better able to judge of its composition than in any other position; unfortunately, these exact conjunctions are very unfrequent, but here are some examples:—

The 23rd of October, 1774, Montaigne saw at Limoges a star of the sixth magnitude through the nucleus of a little comet. This would prove, beyond doubt, that the comet of 1774 had no solid or opaque part, if the star had been seen through the middle of the nucleus; but Montaigne does not say that this was the case, and, in truth, the want of power in his telescope did not enable him to be thus explicit.

On the 1st of April, 1796, Olbers saw a star of the sixth or seventh magnitude, which lost none of its light, although it was covered by a comet; but he tells us, that the star was a little to the north of the centre of the nebulosity, and if the nucleus disappeared for a short time, it was only because of the stronger light of the fixed star. Other cases which produced no real occultation might be cited; and to which the same doubts would apply.

On the other hand, if I were to assert that there does exist a solid and opaque body in the centre of the luminous nuclei of comets, the annals of astronomy would furnish me with plausible arguments in support of that opinion. I might cite Messier, who, when he perceived, for the first time, the little comet of 1774 discovered but one star near the nucleus, but some hours afterwards a second star was seen near the first, and we can hardly help thinking with Messier, that this star might have been at first hidden behind the opaque or solid part of the comet. I might add, that the "Comet of the Short Period," on the 28th Nov. 1828, as observed by M. Wartmann, at Geneva, completely eclipsed a star of the eighth magnitude; and here I will remark, that a positive fact has always an infinite advantage over a negative one, and that the actual eclipse of a star by a comet conveys a proof of a fact, whereas the non-observation of such an eclipse proves only that it did not take place from the probable case, that the solid or opaque nucleus did not pass exactly over the star. However, as I am not a partisan of any system, I will confess that M. Wartmann used too feeble a telescope; and farther, that the observation of Messier would have been more satisfactory if the eclipsed star had been seen before its immersion; but the truth is, we have not data whereon to found a general principle as to the physical constitution of very small comets. Some comets have no apparent nucleus, but are equally bright in all parts, and these are no more than aggregations of gaseous matter; a further degree of concentration may cause in the centre of the nebulosity a nucleus remarkable for its brightness, but which, being still liquid, would be diaphanous, and at a more advanced period this liquid having cooled, will be enveloped in a solid crust, and from that moment the nucleus will be no longer transparent. Then, indeed, the eclipse of a star by a comet would be as real as those occultations of stars which so frequently occur in regard to the moon and the planets.

Nothing, then, proves that no comets exist of this third sort, that is, with solid nuclei; on the contrary, the great brilliancy of some of them fully justify a belief in the solidity of their nuclei. But those who wish to establish some general canon for the nature and composition of all comets, have only to study, as I have done, the archives of astronomy for the last 40 years, to be convinced of the impossibility of finding it.

Without citing all the wonderful stories which have been told of comets whose light equalled that of the sun, and eclipsed that of the moon, I will here give some facts which are incontestable.

Forty-three years before the Christian era appeared a "hairy star," which was seen with the naked eye in the day-time. This was the comet which the Romans believed had received the soul of Cæsar, who was assassinated just before its appearance.

In the year 1402, were two remarkable comets. The first was so brilliant that the light of the sun at the end of March did not hinder people's seeing at mid-day both its nucleus and its tail, which last, to use the language of the day, was full two fathoms

long. The second comet appeared in the month of June, and was visible long before the setting of the sun.

Cardan tells us how every body's curiosity was roused at Milan, by the appearance of a star in 1552, which was visible in open day-light. The fine comet of 1577 was discovered on the 13th Nov. by Tycho Brahe before sunset; but I hasten to a more modern comet, of which we have in an especial treatise detailed observations.

The 1st of February, the comet of 1744 was, according to Cheseaux, more resplendent than Sirius, which is the brightest fixed star of the heavens. On the 18th of February this comet equalled in brightness the planet Jupiter; some days afterwards it nearly equalled Venus in splendour. In the beginning of March this comet was near the sun, and on the 1st many persons saw it at mid-day without glasses.

To sum up. We may conclude, from what we have seen, that there are comets without nuclei, comets whose nuclei are perhaps diaphanous, and comets more brilliant than planets, whose nuclei are probably solid and opaque.

Of the Tail.

The long luminous train by which comets are often accompanied, has been called at all times "the tail." Pierre Apian ascertained that the comet of 1531 carried its tail in every part of its course, so as to have it always in a prolongation of the line which joined the sun and the nucleus; but this principle has been adopted too generally. It is true that for the most part the tail is placed behind the comet, so as to stream out in a direction opposed to the sun; but the line which joins those two luminaries, hardly ever corresponds with the axis of the tail. Sometimes the want of coincidence of these two lines is very great; indeed in some cases the tail stands out at right angles from the line of conjunction. In fact, it has been ascertained that the tail has constantly an inclination towards the region which the comet has left, as if in its motion through a gaseous medium, the matter of which the tail was formed, had been more powerfully acted upon, or resisted, than was experienced by the nucleus.

The tails become much larger, that is, wider as they lengthen out from the comet. In the middle of them is seen a dark band which divides them into two distinct, and often equal parts. Ancient observers considered this band to be the shadow of the body of the comet. This explanation cannot be applied to the tails which point towards the sun; perhaps, we shall suit our hypothesis to general appearances, if we suppose the tail to be a hollow cone, which, from well-known physical causes, might be supposed to present to us two exterior lines of light, separated by a space comparatively dark.

It is not uncommon to see in comets several separate tails. The comet of 1744, on the 7th and 8th March, had as many as six, each about four degrees wide, and 30 degrees to 40 degrees long. Their edges were tolerably light, the lines down their axes gave but a feeble light, and the space between those tails was as dark as the rest of the heavens.

The tails of comets sometimes embrace immense spaces. The following are some of the measurements:—

Tail of comet of 1811, length 23 degrees.
Ditto - 1689, Ditto 63 ditto, and bent like a Turkish sabre, as the contemporaries say.

Tail of comet of 1680, length 90 degrees.
Ditto - 1769, Ditto 97 ditto.

Thus these comets of 1680 and 1769 could reach the horizon and set, while part of their tails were still in the zenith.

I will give here some measurements of comets' tails in leagues, (each league being $2\frac{1}{2}$ English miles.)

Tail of the comet of 1680	more than	41,000,000	of leagues.
Ditto - 1769	ditto	- 16,000,000	ditto.
The several tails of the comet of 1744	ditto	- 3,000,000	ditto.

I ought here perhaps to dilate on the nature of cometary light, on the causes which produce comets' tails, which modify their shapes, &c.; but I will freely confess, that in the present state of science, I could offer on these subjects only gratuitous hypotheses, and unsupported theories.

It is true, cometary science has made great progress during the last century and a half, but the physical composition of these bodies is still wrapped in great obscurity.

12. Are comets luminous themselves? or, do they, like planets, only reflect the sun's rays?

This indeed is a main question not yet answered; but as soon as a comet shall appear, showing to us an evident phasis, all doubts will cease. The phases said to have been seen by Cassini and Dunn, are not substantiated; and in regard to the crescent said to be seen by M. Cacciatore in the comet of 1819 at Palermo, I will only say that the line of the horns, instead of being as it would have been in a real phasis, perpendicular to the line joining the sun and the comet, was, on the con-

trary, parallel to it. On the other hand, the want of phases in the nucleus of a comet surrounded by a thick atmosphere, which might distribute light all over the nucleus, brings us to no certain conclusion; but recent physical discoveries promise us great results, for it has been ascertained that reflected light, when impinging on the eye at certain angles, has some peculiar properties which distinguish it from direct (or primitive) light. In fact, some traces of these properties have been detected by astronomers at Paris in the comet of 1819; but, after all, nothing certain has been arrived at; and in fact, were a body ascertained to be itself luminous, it does not on that account lose the power of still reflecting the light of other bodies.

The nebulosity of comets, when attentively considered, presents also inextricable difficulties. Without doubt it seems easy and natural, at the first glance, to suppose comets to be simply masses of permanent gas and vapours thrown out from the nucleus by the constant influence of the solar rays; but what becomes, under this system, of the luminous concentric envelopes seen round some comets? And why should the nucleus be eccentric, and generally so towards the sun, though sometimes so on the opposite side?

The different magnitudes of the nebulosities of comets are worthy of deep attention, and Hevelius, rising above all system, announced at once that the diameters of the nebulosities increased in proportion as comets receded from the sun! Pringré had also perceived this, but only dared announce it in an incidental manner. Although I do not mean to justify Pingré's hesitation, yet in his day, considering, too, all the difficulties of admeasurement, &c., we cannot wonder at it; and, indeed, it was hard to believe that a gaseous mass should, in proportion as it receded from the sun, that is, as it plunged into colder regions, be considerably expanded, instead of being condensed. But, thanks to the comet of "the short period," the observation of Hevelius is now established beyond all doubt, and is admitted amongst fully recognized scientific truths. I now give a table of the variations which the real diameter of this comet underwent in 1826:—

Dates.	Distance of the Comet from the Sun.	True Diameter of the Nebulosity in Semidiameters of the Earth.
28th October	1.4617	79.4
7th November	1.3217	64.8
30th November	0.9668	29.8
7th December	0.8473	19.9
14th December	0.7285	11.5
24th December	0.5419	3.1

The numbers in the second column depend on the supposition that the earth's distance from the sun is unity. Now, from the preceding table, we see that on the 28th of October the comet was nearly three times farther from the sun than on the 24th of December, but that, notwithstanding this, the real diameter of the nebulosity was about 25 times greater in October than in December; that is, when the distance from the sun was trebled, the bulk was increased 25 times; or, in other words, that during the approach of the comet to the sun, the volume of the comet was reduced to the sixteen-millionth part of its original amount; the sixteen-millionth part corresponding with its least distance from the sun.

It would require a volume to give even an abridgment of the different systems by which astronomers have endeavoured to account for and explain the nature of the tails of comets. Some suppose the lighter particles to be swept away by the impulsion of the solar rays. This might account for tails standing out opposite to the sun, but not for tails perpendicular to that line, nor for six tails at a time, which stand out in all directions: further, some of the comets which appear very thin and light have no tails at all. The resistance of the ether may have something to do with these tails, but we have yet a long time to wait before any thing certain can be predicated of this problem so difficult to solve.

(To be continued.)

RIFLE-SHOOTING.

Sir,—I must confess I read without much surprise, Mr. Audubon's account of expert rifle-shooting, given hypercritically by "Percussion Cap," at page 11.

A friend of mine, who has passed many years in the United States and the Canadas, has frequently described similar performances to me. He is himself a good shot; indeed, from his long residence in America, he had become as expert in the use of the national weapons—the axe and the rifle—as many who were "Yankee-born;" and he maintains that there are no rifles, or marksmen, equal to those of America.

One anecdote which he relates, connected with rifle-shooting, is so extremely curious, that I think it worthy of a little consideration. He says that when any one arrives in America from the "old country," and, as is frequently the case, begins to boast of his abilities as a marksman, brother Jonathan ridicules him and tells him that it is no use for him to set

up for a marksman, seeing that he cannot hit a flour-barrel at forty yards. The "old countrymen" of course treats such a statement with ineffable contempt, and offers to wager a trial at some smaller and more respectable mark. Jonathan, however, continues positive as to his inability to hit the flour-barrel, and will permit no other target. Accordingly, the parties proceed to decide the wager; a flour barrel is procured, and placed with the end from which the head has been removed towards the shooter, who is directed to send a ball through the bottom, if he can. The "old countryman" takes his aim with the utmost confidence and self-complacency, and fires—but, lo! to his utter confusion and dismay, the ball instead of passing through the bottom, to the very centre of which it had been directed, has gone out at the side! He is jeeringly told to try again! A second, a third, and many more shots are fired, with the same result. The Englishman, to his great chagrin, is at length obliged to give up the trial; although he has really little cause to grieve, for if he had put brother Jonathan to the same trial, whatever his skill might have been, he would have fared no better than himself—the fact being, as is well known to the Americans, that the air in the barrel invariably turns the ball aside, and prevents its striking the bottom.

It is said that a knowledge of this circumstance was made use of in the loop-holes, in the fortifications of Quebec, which are so constructed, that a ball cannot enter the loop-holes, being turned aside by the air, while the men on the batteries can annoy an enemy in perfect security.

As I presume this phenomenon is not peculiar to the air of America, the experiment can be verified by any of your readers who doubt the accuracy of the statement; for my own part, I have the greatest confidence in the honour and veracity of my informant.

A rational explanation of this singular affair, upon philosophical principles, will, no doubt, amuse and oblige many of your readers, but especially,

Your obedient Servant,

W. Baddeley.

London, October 11, 1832.

[This is one of those *facts* which there is no believing without seeing; and never having seen any thing of the kind, nor being able to conceive how such a thing should come to pass, we must, with all respect for our intelligent correspondent, and the "honour and veracity" of his informant, rank it for the present as but a suitable appendix to "Audubonian." Perhaps, some of our rifle-shooters will go out to Chalk Farm, and put the matter to the test of experiment.—Ed. M. M.]

ERICSSON'S STEAM-ENGINE AND WATER-WHEEL.

Sir,—I beg to be allowed to reply briefly to some of your remarks on my observations on Mr. Ericsson's steam-engine.

First, as to the manufacturing part. I have spoken to several intelligent workmen, who all agree that the dome will need to be *ground* after it is turned, to make the packing of the circumference of the disc steam-tight.

I stated that the packing in the disc, which presses against the leaves or piston, requires to be brought to a sharp edge, meaning, that they should be wedge-shaped. You ask why *required?* I reply that the inventor seems to be of that opinion, as he has so represented them—that that form requires the least quantity of motion of the packing in the grooves, and that the wedge-form is best, as it presents no surface for the steam to act upon in direct opposition to the springs of the packing. At the same time, I fear it will be difficult to make any form of packing steam-tight in this part, as owing to the continually varying positions of the disc and cone, no packing can expose a surface of contact to the leaf, but only a line.

The objection of the want of sufficient abutment for the steam, should be considered in connection with the force exerted to separate the surfaces, and to prevent any intimate contact, I have shown that at one point this force tending to cause leakage and friction, is nine times as great as the moving force;* it is true that this external pressure may be counteracted (and even the sliding motion of the disc got rid of if deemed of any consequence); but as no means of doing so were shown, my objection was perfectly just.

I shall rejoice should my apprehensions

* The reader is referred to what was said on this head by "Mechanicus" in our last Number.—Ed. M. M.

be groundless, or should the patentee succeed in remedying these defects, and the engine prove merely equal in power to the common reciprocating engines, as I am aware of the great advantage in numerous situations which such an engine must possess.

Your most obedient,
J. MURDOCH.

Sept. 10, 1832.

Sir,—When I stated the leakage of Mr. Ericsson's wheel, if used as an unpacked hydraulic engine, to be 9½ times that of an equal alternating engine, I did not overlook the circumstance stated by "Mechanicus," that the water would get behind the plane and cone; but it has entirely escaped your correspondent that the *unpacked* slit in the plane must *necessarily* be so much wider than the thickness of the wing upon which it works, as to allow for its alternately oblique and horizontal positions; thus, a leakage through this slit becomes *unavoidable*, to an extent at least as great, *if not greater*, than the amount of any saving, from the necessity imposed upon the fluid of passing into, and out of the included spaces alluded to, and from every other circumstance mentioned by "Mechanicus;" I, therefore, set the one against the other. Besides, even if the pressure to create leakage be taken only as half the operating column, which is quite correct, the fact must be borne in mind that a half pressure will induce a leakage (or spout) *greater than half*, in the ratio of 10 to 7 nearly. I do not, however, wish to be understood as maintaining that the amount of *leakage*, even as I have taken it, would be an insurmountable objection; but I am quite satisfied that *without the addition of an air vessel*, as I have before suggested, "to equalise the fluctuating pressure and inertia of the fluid upon the varying dimensions of those parts of the wings subjected alternately to its mechanical action," the machine would very soon be destroyed, if put into rapid and powerful action.

To conclude, I wish to assure "Mechanicus" that I have no desire to undervalue the ingenuity of Mr. Ericsson's machine, which I really think is very original, both in its conception and arrangement, and is, in my opinion, notwithstanding the circumstances I have pointed out, highly creditable to his inventive faculties.

I am, Sir,
Your very obedient servant,
C. A. BUSBY.

Stanhope-Place, Brunswick-Terrace,
Brighton,
October 13, 1832.

P. S.—The printer has put *ultimately* for *alternately*, line 9, 2nd column, page 21, in my last article.

[A reply by "Mechanicus" to Mr. Busby's preceding letter, reached us at too late a period of the week for insertion in our present number, but shall appear in our next. Our readers will do well in the meanwhile to suspend their judgments on the points at issue.—ED. M. M.]

EXPERIMENTS WITH A LOCOMOTIVE-ENGINE OF AMERICAN MANUFACTURE.

(From the Baltimore Patriot of August 17, 1832.)

"There is one great advantage in this horse; he neither eats nor sleeps, nor costs any thing in shoeing, and ambles without wings in such a manner that his rider may hold a cup full of water in his hand, without spilling a single drop, his motion is so smooth and easy; for which reason, the fair Magalona delighted much in taking the air upon his back."

"I should be glad to see this same beast," replied Sancho. [DON QUIXOTE.]

A horse which the discerning Sancho would have pronounced of the same merit and mettle as the famous "Wooden Peg the Winged," having been constructed by those ingenious magicians, Messrs. Davis and Gartner, of York, Penn.; a trial was made yesterday of his speed and bottom, which resulted very much in favour of his pedigree. With a train of six passenger cars, conveying about 90 passengers, he left the Pratt-street depôt at four minutes past six in the morning, and conveyed his burthen, a *fair* portion of which consisted of ladies, in a very gallant style to Ellicott's Mills, in one hour precisely. The party having breakfasted here, proceeded to the foot of the Inclined Plane, No. 1, a distance of forty-one miles from the depôt, which was accomplished by 28 minutes past ten o'clock; the actual time of travel, exclusive of stoppages, being three hours and ten minutes, which is at the rate of nearly 13 miles the hour. At the foot of the Inclined Plane, all the passenger cars from Frederick, except one, were added to the returning train, which started at eight minutes past twelve; and the first 15 miles of the return were accomplished

in an hour. Ten miles and a half were done in forty minutes. At twenty-three minutes past three P. M., the cars reached the Pratt-street depôt, where they were detached from the locomotive, in order to be brought into town by horses. The actual time consumed in returning (the stoppages amounting to fifteen minutes) was precisely three hours, a little more than 13 miles the hour. It must be recollected that the elevation overcome in the 41 miles to the foot of the Inclined Plane was 567 feet, the actual height of that point above tide being 633 feet. From the mouth of Gillis' Falls to the foot of the plane, a distance of four miles, the elevation varies from 32 to 57 feet the mile; yet this part of the road was ascended in 18 minutes, or at the rate of 13 miles an hour; the engine not using all its power, but throwing off redundant steam a great portion of the time. The whole time lost in stoppages in ascending and returning, was three hours twenty-seven minutes; so that the 82 miles were accomplished in the actual time of five hours fifty-two minutes.

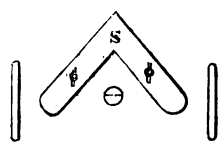
This satisfactory trial, we presume, will induce the company forthwith to apply steam power on the road for the transportation of both passengers and burthens. The engine, on this trip, performed what ordinarily requires the labour of 52 of the company's horses; and the engineer and two assistants served the purpose of six drivers.

We were insensible of any loss of speed at the curvatures, which are the greatest on this part of the road; on the contrary, the huge bulk moved along with regular and astonishing speed, apparently unretarded either by the winding or the ascent of the way. The power of the engine was never fully tested, steam being constantly let off the whole way. A few days since, with a heavier train, it performed the distance from town to Ellicott's Mills, 13 miles, in 54 minutes. The fuel is anthracite coal; less than half a ton was used in the ascent of the 41 miles.

This very successful experimental trip naturally gave great satisfaction. In the short time of five hours fifty-two minutes, the party had travelled, without fatigue, what was equivalent to one-third of the journey to the Ohio, by the contemplated road, with a company of 90 persons, (145 in returning,) with a weight of 50 tons, and with a single engine; establishing the fact, that within the twenty-four hours, a merchant might travel from the mouth of the Patapsco to the banks of the Ohio. How short a time since such a vision of improvement would have cast a doubt on the sanity of the prophetic seer!

PAPER-STAMPING PROCESS.—See Mech. Mag. for 28th July 1832.

Dear Sir,—In your Journal of the 3d March last, I find Mr. Baddeley inquires how the paper is put under the dye, seeing the press cheeks are only 11 inches apart? The mode is simply this:—I put in the paper *cornerwise;* so that whether the sheets are 4 feet square, or 4 inches, there is space enough. Observe this, however, that the cylinder with the stamp must be brought 1 inch nearer the front side of the press. A wood square is used, half an inch thick, with chased mortises and set screws to suit any sized paper. The operation will perhaps be better understood by inspection of the following plan, in which S represents the square.



With respect to what Mr. B. says about the saving of labour, I have to state, that one lad sufficed to work the small hand-press (so in fact, though called a fly-press), till it made his hand sore, when he asked the director for the help of an old soldier, or labourer. Neither men nor boys, I beg to remark, are used here in the way we sometimes read of in English newspapers. Take, for example, the statement of a Leeds man, in the "Herald" of the 29th of May, 1832. I do not believe that anything half so bad ever happened in this country. The truth is, that you Englishmen are harder worked than any other men under heaven. You have this advantage, it is true, to boast of (if it be one), that between your overworking and your admirable machinery together, you can bid defiance to all foreign competition. Some one recently said, in your House of Commons, "We cannot compete with foreigners—they work so cheap." Never was there a greater mistake. Mr. Baird, who employs here more than a thousand men in the manufacture of steam engines and other machinery, told me this year, that Maudslay, of London, could sell him boiler plates, ready purchased, for less money than he can buy the sheet iron for in St. Petersburgh! He added, that if the ports were only open, England could

deluge the country with goods in six months, and knock up all the manufactories in (Continental) Europe.

I am, dear Sir, yours, &c.

WM. REED.

Peterhoff, June, 1832.

P. S. As to my paper-cutting machine, I beg to inform Mr. Baddeley that I worked a long time at Foudrinier's Mills, and know all Dickenson's patents; but that, though they both cut paper in single sheets, they never ploughed it in reams, as I do—five at a time.

NOTES WORTH NOTICE.

"Facts are the stuff science is made of. Theory is nothing of itself: it must be raised on a superstructure of facts, and by facts be cemented together—or it will 'topple to its fall.'"

Railways in France.—The attention of the French has not been so highly excited by any thing since the Thames Tunnel, as by the Liverpool and Manchester Railway, and the performance of the locomotive engines there. They are now congratulating themselves that they have no longer any need to cross the channel in order to witness the wonder-working effects of the new mode of communication; a *chemin-de-fer* having been begun, and almost completed, from St. Etiénne to Roanne, in the south of France. Our lively neighbours had not patience to wait for its entire completion; but, on the 1st of July last, got up a grand procession for the opening of the railway, then passable along nine-tenths of its line. On this occasion, two locomotive engines were used, although all their "appliances and means" had not yet arrived from England, where they had been constructed—one by Mr. Stephenson, the engineer of the Liverpool and Manchester railway; the other by Fenton and Murray, of Leeds. They drew twelve carriages, carrying four hundred persons, who, to their great surprise and delight, made the journey of 20 leagues (each league about 2½ miles English) in two hours and fifty minutes, and performed the short distance from Feurs to Montroud (three leagues) in only twelve minutes. The company, which included the Mayor of Roanne, and a great many of the neighbouring gentry, especially ladies, were highly gratified at the result; and it was the general opinion that the railway ought to be continued through Paris to the north of France; which it is not unlikely may be the case, should the present enthusiasm continue for any length of time. The name of the undertaking now in progress, or by this time finished, is the "Railway of the Loire." It is said, that the French government have directed the preparatory steps to be taken for constructing a great railroad from Paris to the Netherlands, with branches to Calais and other principal cities. If this be the case, there may soon be a greater length of roads of this description on the Continent than in England, especially as Belgium, in the event of peace, seems likely to catch the contagion.

Greenwich Railway. — This project, though, like all its brethren, rather in the background just at present, is not by any means given up. It has been determined to proceed with the bill in the next session of Parliament; and, in order to reduce the estimates, that part of the scheme which contemplated the carrying of the whole length of the railway on a high-arched viaduct, over the very tops of the houses, has been abandoned, and it has been resolved to come a little nearer to *terra firma*; so that the whole affair has not near so much the appearance of a *castle in the air* as at first. The new idea certainly appears the more rational, although the crowded neighbourhoods through which part of the line must run will present no inconsiderable difficulties.

The Author of Waverley.—Sir Walter Scott, "the greatest name of the nineteenth century," was for some years President of the Royal Society of Edinburgh, and also held the honorary office of Secretary for Antiquities to the Royal Academy. Sir Walter, as most readers are doubtless aware, after having contributed more than any other writer, of his own or any time, to the harmless enjoyment of both high and low, died (worn out by his exertions to liquidate a debt not contracted by himself), at his seat of Abbotsford, on Friday, the 21st of September. The Author of Waverley has often introduced *mechanics* as playing a considerable part in the scene of his novels; but never more than in the Fair Maid of Perth, the hero of which is no other than a stout true-hearted smith, although by his deeds he proves himself "one of heaven's nobility." *

* In one of the prefatory epistles to his admirable novels, he has paid a tribute to the genius of that first of modern mechanics, James Watt, which it may not be out of place here to transcribe; it is by far the most brilliant sketch of his character, which has yet appeared, and shows that as far as ability to appreciate scientific and mechanical merit went, Sir Walter Scott was not unworthy of that official eminence in the scientific world, to which, as some people thought at the time, he was somewhat absurdly raised, when elected to the chair of the Royal Society of Edinburgh.—ED. M. M.

"Did you know the celebrated Watt of Birmingham, Captain Clutterbuck? I believe not, though

The City Poet and the Old Bridge.—In a former note, allusion was made to the praiseworthy efforts of Mr. Payne, the barrister, to confer immortality on the names of all the City magnates concerned in the erection of the New London Bridge, by "marrying them to immortal verse." This gentleman, who now dubs himself the "City Laureate," has lately sent forth another thin volume, containing a most 'affecting' "Farewell to Old London Bridge," in which sentimental tears are pumped up as naturally as the "liquid element" used to be at the old water-works! This is tacked to a poem on the new Lord Mayor, which, thanks to the ingratitude of some of the former immortalized, who took no *pleasure* in the works of *Payne*, particularizes nobody but Sir Peter himself.

from what I am about to state, he would not have failed to have sought acquaintance with you. It was only once my fortune to meet with him, whether in body or spirit, it matters not. * * Amidst this company stood Mr. Watt, the man whose genius discovered the means of multiplying our national resources, to a degree perhaps even beyond his own stupendous powers of calculation and combination—bringing the treasures of the abyss to the summit of the earth—giving the feeble arm of man the momentum of an Afrite—commanding manufactures to rise as the rod of the Prophet produced water in the desert—affording the means of dispensing with that time and tide which wait for no man—and of sailing without that wind which defied the commands and threats of Xerxes himself.* This potent commander of the elements—this abridger of time and space—this magician, whose cloudy machinery has produced a change in the world, the effects of which, extraordinary as they are, are perhaps only now beginning to be felt—was not only the most profound man of science, the most successful combiner of powers and calculator of numbers, as adapted to practical purposes; was not only one of the best informed, but one of the best and kindest of human beings. There he stood, surrounded by the little band of northern literati; men not less tenacious generally speaking of their own fame and their own opinions, than the national regiments are supposed to be jealous of the high character which they have won upon service. Methinks I yet see and hear, what I shall never see or hear again. In his 85th year, the alert, kind, and benevolent old man had his attention at every one's question, his information at every one's command. His talent and fancy overflowed on every subject; one gentleman was a deep philologist—he talked with him on the origin of the alphabet, as if he had been coeval with Cadmus; another, a celebrated critic—you would have said the old man had studied Political Economy and Belles Lettres all his life; of science it is unnecessary to speak, it was his own distinguished walk. And yet Captain Clutterbuck, when he spoke with your countryman, Jedediah Cleishbotham, you would have sworn he had been coeval with Clavers and Burley, with the persecutors and persecuted, and could number every shot the dragoons had fired at the fugitive Covenanters. In fact, we discovered that no novel of the least celebrity escaped his perusal, and that the gifted man of science was as much addicted to the productions of your native country (the land of Utopia aforesaid), in other words, as shameless and obstinate a peruser of novels, as if he had been a very milliner's apprentice of eighteen."

* Note by Captain Clutterbuck. Probably the ingenious author alludes to the national adage—

The King said, sail;
But the wind said, no.

Our schoolmaster, who is also a land-surveyor, thinks this whole passage refers to Mr. Watt's improvements on the steam engine.

Ship-building in China.—The Chinese have begun to adopt a new method of ship-building. Instead of using stocks, they support the vessel between two boats, which lie out quite away from the shore, and when it is ready for launching, they simply withdraw the boats, and the new vessel at once reaches its destination. This scheme is of particular utility in the land of its birth, as, by means of it, the builders evade the extortions which are always practised by the mandarins when ships are built in the usual manner on shore. We presume that as soon as these gentry become aware of this result, the ship-builders may bid farewell to the great advantages of their "new system!"

Slow Movement of Steam Carriages.—The tardy progress made in bringing steam-carriages into use, continues to excite general astonishment. Mr. Goldsworthy Gurney, who professed so long ago to have overcome every difficulty, seems to have quite retired from the field, at least for the present. It is now most prominently occupied by Messrs. Ogle and Summers, of Millbrook Foundry, Southampton, who are so well convinced of the perfection to which they have brought *their* machine, that they advertise, quite as a matter of course, that they will supply the public with steam-propelled vehicles to go at any speed. Mr. Walter Hancock also is so confident that his invention must succeed, that he wishes to set on foot a company to monopolize at once all the intercourse between the City and Paddington, although, for some unexplained reason, he has taken "The Infant," which *did* run for some time to Stratford, off the road. Besides these, there are numerous other speculators,— Mr. Burstall among the number; but none have yet gone so far as to bring their invention to the test of actual practice, by endeavouring to supersede the every-day horse-drawn stages on any road whatever.

Statistics of London.—The universal inaccuracy of the French as to facts is well known. A certain M. Cæsar Moreau has attained to a great eminence amongst them for his statistical labours; but, if we may judge from a table of the statistics of London lately sent forth by him, with very little foundation. According to this gentleman, London is about fifteen miles long by nine wide! but, to make up for

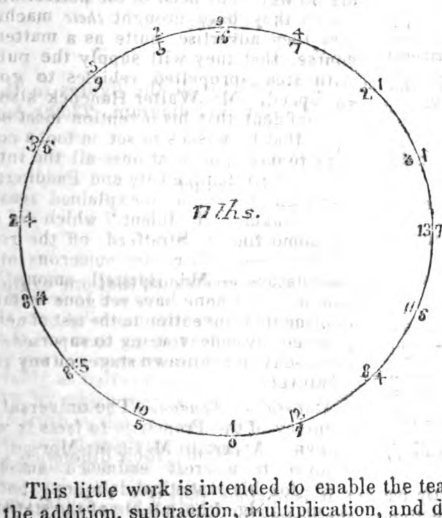
this, he allows the inhabitants only 424 "churches or chapels," by which, if he means "places of worship," he is a *little* under the mark. The number of periodical works issued in the metropolis he gravely states at 140, daily, weekly, monthly, quarterly, yearly, and all; when, in fact, the weekly publications alone would go very far towards reaching that number. So much for statistical accuracy! The French are like Napoleon on this score, who admired a ready answer, without caring a tittle for its truth.

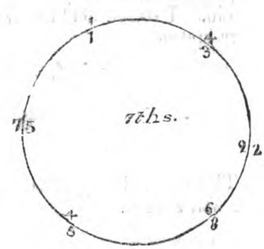
English Tribute to French Science.—The Royal Institution of Great Britain, it appears, has given into a somewhat foreign custom, by sending a letter of condolence to the French Academy, on the death of their late distinguished Secretary, Baron Cuvier. The letter concludes by saying, "The Royal Institution, which ranked Cuvier among the very small number of learned foreigners who were connected with it as honorary members, has deeply to deplore the event which deprives it of the lustre reflected by that illustrious name, and of the example shown by his admirable works."

Politics versus Mechanics.—The London Mechanics' Institution has wisely thrown off even the appearance of connection with politics. Such a connection, if persisted in, would have proved a complete stumbling-block in the way of its usefulness. In the country, however, it is to be regretted that the independent character of some of these institutions has been lost sight of. For instance, the Exeter Mechanics' Institution has been converted into a committee-room for carrying on the election of Lord John Russell, contrary to the wishes, no doubt, of many of its warmest friends, whatever may be their political sentiments. Such things must be avoided, or Mechanics' Institutions will fall to the ground: they will be swallowed up in the vortex of politics. F. H.

NEW PUBLICATIONS CONNECTED WITH THE ARTS AND SCIENCES.

A New View of the Relations of Numbers. With two Diagrams. The whole forming a complete Master-Key to the Elements of Arithmetic. By Patrick Whytock, late of Glasgow. 24 pp. 12mo. Orr.





This little work is intended to enable the teacher of arithmetic to check errors in the addition, subtraction, multiplication, and division of arithmetical quantities, without the fatigue of examining the whole work. The present application of Mr. W.'s method is, as far as we know, new; but the principle upon which it is founded (although certainly not noticed by any of the writers on arithmetic), has been long familiar to arithmeticians. The following properties of the fractions, $\frac{1}{7}$, $\frac{1}{17}$, $\frac{1}{19}$, form the foundation of Mr. W.'s new system.

If $\frac{1}{7}$ be expanded into a decimal, it produces the circulate, ·142857, &c.; and accounting the given numerator 1 as the 1st remainder, the quotients and remainders will stand as under:—

$$\frac{1\ \ 4\ \ 2\ \ 8\ \ 5\ \ 7}{1,\ 3,\ 2,\ 6,\ 4,\ 5}\ \begin{matrix}\text{quotients.}\\ \text{remainders.}\end{matrix}$$

In the same way, by expanding $\frac{1}{17}$ into a decimal, we obtain ·0588235294117647, &c.

$$\frac{0,5\ \ 8\ \ 8\ \ 2\ 3\ 5\ 2\ 9\ \ 4\ 1\ 1\ 7\ \ 6\ \ 4\ 7}{1,\ 10,\ 15,\ 14,\ 4,\ 6,\ 9,\ 5,\ 16,\ 7,\ 2,\ 3,\ 13,\ 11,\ 8,\ 12,}$$

In the fraction $\frac{1}{7}$, as every possible remainder is included in the numbers 1, 3, 2, 6, 4, 5, Mr. W. designates the quotient ·142857 a perfect circulate; the same is true of the quotients and remainders of the fraction $\frac{1}{17}$. He then places the quotients and remainders round a circle, as in the prefixed diagrams.

From this arrangement it is obvious, that the decimals of $\frac{2}{7}$, $\frac{3}{7}$; $\frac{4}{7}$, &c., will produce the circulates, ·285714, ·428571, ·571428, &c., the first figure of the circulate being contiguous to the given numerator, and each proceeding in a regular circular order, as in the diagrams. Or, if 142857 be considered as an integral number, and be multiplied by 2, 3, 4, &c., the products will be 285714, 428571, 571428, &c.

If any of the fractions, $\frac{1}{7}$, $\frac{2}{7}$, &c., or $\frac{1}{17}$, $\frac{2}{17}$, &c., be multiplied by such numbers that the product shall exceed unity, and if the corresponding decimals be considered as finite, or integral numbers, a little correction will be necessary. Thus, if 428571 be considered as an integral number, and that it is to be multiplied by, say 16, the product is 6,857136, the two last figures, 36, not following the circular order of the diagram. Now, if we consider $\dot{4}2857\dot{1}$ a pure circulating decimal, then, when multiplied by 16, a carriage of 6 will arise, on account of the extension of the circulate beyond the right-hand figure 1; the product in that case being $6{,}\dot{8}5714\dot{2}$ ∴ the operation by the diagram will be,

$$428571 \times 16 = \tfrac{3}{7} \times 16 = \tfrac{48}{7} = 6\tfrac{6}{7} = 6{,}857142$$

$$\text{Excess of carriage, } 16 \times {\cdot}42 = \qquad 6 \text{ subtract}$$

$$\text{Product } 6{,}857136.$$

It is not necessary that the multiplicand should extend to all the figures in the circle. Let 235294117647 be multiplied by 275. By the 2nd diagram, 23529, &c. correspond.

$$\tfrac{4}{17} \therefore \tfrac{4}{17} \times 275 = 64\tfrac{12}{17} = 64{,}705882352941$$

$$\text{Excess of carriage } {\cdot}058 \times 275 = \qquad 16 \text{ deduct.}$$

$$\text{Product } 64{,}705882352925.$$

The method of performing *subtraction* by the diagram is so obvious, that one example will suffice.

From 941176470588
Take 235294117647

Rem. 705882352941.

These numbers will correspond to $\frac{16}{17}$ and $\frac{4}{17}$ in the 2nd diagram; their difference is $\frac{12}{17}$, which answers to 705882352941.

Division being the converse of multiplication, it is obvious, that if $\frac{6}{7}$, $\frac{5}{7}$, $\frac{4}{7}$, (1st diagram) be divided by 2, 5, and 2, respectively, the quotients will be $\frac{3}{7}$, $\frac{1}{7}$, and $\frac{2}{7}$, the numbers answering to which will be found opposite to 3, 1, and 2, in the 1st diagram. Or, if $\frac{15}{17}$, $\frac{14}{17}$, $\frac{12}{17}$, be divided by 5, 7, and 2 or 3, 2 and 6, the respective quotients will be $\frac{3}{17}$, $\frac{2}{17}$, $\frac{6}{17}$, and $\frac{5}{17}$, $\frac{7}{17}$, $\frac{2}{17}$, and all these quotients will be found in the 2nd diagram, opposite to the respective remainders. Thus, $\frac{12}{17} \div 6 = \frac{2}{17}$ or 1176470588235294.

And in all these cases there will be no remainders. But when the divisor is greater than either of the respective denominators of the diagrams, we must make up or compute a dividend, so that the quotient may observe the circular order of the diagram.

Suppose 16 is the divisor, and $\frac{3}{7}$ the quotient ∴ $16 \times \frac{3}{7} = \frac{48}{7} = 6\frac{6}{7}$. For $6\frac{6}{7} \div 16 = \frac{3}{7}$.

Or 16)6,857142

Quotient 428571 rem. 6.

The quotient 428571 is found from the 1st diagram, answering to $\frac{3}{7}$, and the remainder is found by multiplying 16 by the next figures in the circle which follow 1, the last figure in the quotient, namely, $16 \times \cdot 42 = 6$ (see the converse question in multiplication.) Take another example:—Let the divisor be 3275, the quotient $\frac{4}{17}$, and to contain 6 places of figures ∴ the dividend will be $3725 \times \frac{4}{17} = \frac{14900}{17} = 876\frac{8}{17}$.

3725)876,470528

Quotient 235294 rem. 438.

The figures in the 2nd diagram that follow 235294 are ·1176 ∴ 1176 × 3725 = 438, the remainder. When the divisor consists of many figures, the only tedious part of the operation is in computing the remainder.

Addition, although first in order, is the last treated of; and here we must observe, that the circular method possesses *no advantage whatever*. We shall give, however, Mr. Whytock's own explanation on this head:—

"In addition, the operation of checking errors proceeds on somewhat a different principle. An example from the diagram of 17ths, which consist of 16 figures, will make it plain. We may part these 16 figures in continuation into equal sections, forming lines—say of two, four, or eight places in each line. Introduce any where in the column a line of digits, taken at random. The sum will have an *ultimate* carriage of a unit for every two lines taken from the diagram. The rest of the sum will uniformly be the random line, *minus* the ultimate carriage.

* At Radius 4	2352	
	9411	
	7647	
	588	
	365	Random Line.
At Radius 3	1764	
	7058	
	8235	
	2941	
	40361	

"Here the ultimate carriage is 4, just half the number of lines taken from the diagram, and the rest of the sum is the Random with 4 abated; say 365—4=361.

"It may be noted that we may commence writing at any radius or point; but if we begin it, we must go quite round it ere we stop. We may also note, that other diagrams do not part so conveniently into equal sections or lines; nor is their ultimate carriage invariably as half the number of sections. A few trials will enable any one to discover the law by which they are governed in this particular."

The truth is, the law by which they are governed is this:—When the 16 figures are divided into 4 sections, the sum of the digits in every two alternate lines is 9. Take, for example, the first 4 lines of radius 4:—The sum of the 1st and 3rd lines, and of the 2nd and 4th, is 9,9,9,9. The same is true as to the 4 last lines of radius 3; the sum of all wanting the random line is 39996, and adding 4 to this sum, and subtracting 4 from the random line, the sum is 40000 + 361 = 40361. Or, if the 16 figures are divided into sections of 8 figures, then the sum of the digits, in first and second lines, will always make 9. So will those of the 2nd and 4th, &c., whatever the radius may be; but all this may as easily be done without as with the aid of the circular diagrams.

* Radius is what we have termed Remainder.—*Rev.*

Substance of an Address on the Right Use and Application of Knowledge, lately delivered to the Mechanics of Manchester at their Institution in that town. By JOSEPH JOHN GURNEY. London: Darton and Harvey.

The leading object of this Address is to show that all mathematical and philosophical knowledge has its foundation in mere *faith* or *belief*; and to deduce from this an argument of the irrationality of those who refuse their assent to Christianity because it rests in part on the same foundation. We do not think that discussions of this sort are well suited to Mechanics' Institutions; and if they were, we should not hope for much good to the cause of religion, by such a display of bad logic in its behalf as this Address of Mr. Gurney's displays. He observes, that the existence of external objects is a thing "utterly incapable of proof," but that "although it is impossible to demonstrate this truth, our nature compels us to admit it." This is the old doctrine of Berkeley revived, and involves, as we dare say ninety-nine of the humble mechanics whom the lecturer addressed could have told him, its own refutation. The fact that our nature *compels* us to admit "their existence" is the proof that they do exist. Again, he tells us that the principle that every effect must have a cause is one "which no man can prove, but which every man is compelled to believe; the belief of it is wrought by the hand of God into the constitution of our nature." The answer here is the same as before; the proof that there must be a cause for every effect is, that it has not been "wrought into the constitution of our nature" to imagine an effect without one. A little further on Mr. G. asserts, that "the whole science of mathematics, pure and perfect as it is, rests on axioms of which we cannot by any possibility *prove* the truth." He then takes, by way of example, the axiom that "the whole is greater than the part," and throws out this bold challenge to prove it:—"I defy the most ingenious student among you to demonstrate this axiom, either by a chain of reasoning or by any other means." A very silly defiance, since it all turns on confounding, as in the other cases we have quoted, truths that are self-evident, and therefore need no demonstration, with truths that are occult and require reasoning and experiment for their developement. In short, the whole of Mr. Gurney's ground-work resolves itself into a similar play upon words, quite unworthy of the high purpose to which it is applied. His Address evinces considerable oratorical talents, and abounds in liberal and humane sentiments; but, in other respects, his qualifications for the task of a public instructor are by no means of the highest order.

Observations on the Nature of Cholera and its Remedy. By G. R. BOOTH. Printed by W. Rowley, Hanley, 8 pp. 8vo.

We select this publication for notice from the multitude of works which have appeared on the same subject, because it takes the same philosophical view of it which was done in this journal a few weeks ago by our able correspondent, Mr. Abraham Booth—a coincidence not the less remarkable that the authors of both productions are of the same name. Mr. G. R. Booth, like Mr. Abraham Booth, thinks that the nature of cholera, and, of course, the best means of curing it, may be best arrived at by *chemical analysis*. He compares the blood of a person who has died of the disease with the condition of blood in its healthy state, and having ascertained that the principal difference consists in this, that of the two primary constituents of blood, serum and crnor, the former is almost entirely abstracted—whereby "the blood loses its power to flow, and coldness, cramps, and death ensue"—he draws the very reasonable inference, that the most efficacious means of arresting the disease is to supply the element that is wanting; which element consists of albumen chiefly, and muriate of potash and soda, to hold it in solution. The white of eggs, he says, affords the best supply of albumen, and he recommends that it should be administered with water-gruel, or any other mucilaginous liquor, "taking care, however, that it is slightly aired, as heat will coagulate the albumen." Mr. G. R. Booth states in a note, that since his pamphlet was written, a person recovered perfectly from an attack of the cholera (to all appearance) by adopting the following course of cure:—Three eggs were boiled half a minute, and the white part only eaten, with a little salt and stale home-made bread; in an hour afterwards one tea-spoonful of magnesia, and half a tea-spoonful of rhubarb, were given, and in an hour after this a wine-glass of brandy, with three of water. The pamphlet is cleverly written, and seems well deserving the attention of the medical faculty.

INQUIRIES.

Mr. Editor,—As your excellent Magazine has become the medium of scientific and general communication throughout the kingdom, and you have evinced a willingness to extend its influence to

every inquiring mind, I am induced, as an old subscriber, to request the favour of some of your friendly and numerous correspondents, affording me a piece of information, through your journal. which I have long endeavoured privately to obtain. Some few years since I was much gratified by the inspection of several beautiful specimens of art, executed in *coloured sand;* they were faithful copies after "Morland's cattle pictures," and had a bold and splendid effect. In a recent ramble, as an amateur artist, through the Isle of Wight, I visited a spot called Alum Bay, celebrated for its variously coloured sand, which is collected and sold in glass bottles in most of the ships in the island, curiously figured. Recollecting the above circumstance, I availed myself of the opportunity, and collected almost all the tints required (except the lake and scarlet). I wish now to begin upon a copy of a Snyder which I have in my possession, but I am quite at a loss how to commence operations. What I am, therefore, desirous of, is some instruction in this art of pictorial representation from any person who has cultivated it, either by way of amusement, or as a source of profitable employment.

I am, Sir, your obedient servant,
TRANQUIL.

Sir,—Perhaps some one of your many intelligent correspondents can inform me whether there is any substance which, being placed between a magnet and a steel object, has the power of preventing the attractive power of the former for the latter from being exerted, or whether there is any known means of *temporarily* suspending the power of attraction in a magnet, WITHOUT INJURING IT PERMANENTLY.

Your very good wisher and
very old subscriber,
T. O. M.

Sir,—As you have admitted one letter upon the subject of oil, perhaps you will favour a now-and-then correspondent by inserting the following:—

I have several very fine plants of the *Palma Christi* growing in my garden. Some of them are 9 feet high, and abounding in seeds, which, I apprehend, contain the castor oil. But I am ignorant how the oil ought to be expressed, and whether any other part of the plant yields oil besides the seeds.

I have no doubt but you have many readers capable of informing me, to any of whom I should feel obligation for the information.

I am, Sir, your obedient servant,
CASTOR.

ANSWERS TO INQUIRIES.

BLACKING.—"A Subscriber" at Cork asks for a receipt for making blacking, "as his family is numerous and purchasing at 18d. per bottle is more than he can well afford." We subjoin one which is given in the *Annales de Chimie*, by the celebrated French chemist, Braconnot, who pronounces it to be as compared with all the other known blackings, from Day's to Hunt's, "undoubtedly the cheapest and the best." Macerate one pound of malt in boiling water till every thing soluble is taken up, add 2½ lbs. of plaster of Paris well sifted, and 7 ozs. of lamp black; then evaporate to the consistence of paste; and finely mix up with 1lb. 2ozs. of olive oil. It is said to spread very evenly, dry speedily, and shine brilliantly, with very little brushing; while it neither burns nor injures the leather.

SPRINGS OF PACKING RINGS.—J. W. states that about two months since he introduced into a machine of his invention, springs of a similar nature to those employed in Mr. Ericsson's engine, to keep the packing rings tight, and that he had never "seen or heard of any thing of the kind before." He wishes therefore to know whether Mr. Ericsson's patent will preclude him from the use of them? We answer, no; neither him, nor anybody else. We do not understand that there is any thing new in the packing rings of Mr. Ericsson's engine; it is divided into segments, like any common metallic piston, and pressed out by little spiral springs in a similar manner.

POISONOUS SWEETMEATS.—We have but little sympathy for the case of the "Mother" whose children were nearly killed by eating the "pretty-coloured sweetmeats;" but if she will persist in treating them to such trash, we would recommend her first to empty her hartshorn bottle upon the comfits; when, if there is any copper in them (as there is in most of the coloured ones), the liquid will become blue; and, if there is not, they will be luckily rendered unpalatable. The risk of spoiling the comfits is something; but she will decide for herself between that and the risk of poisoning her children.

THUNDER CLOUDS.—The rule of which M. W. speaks (but gives somewhat incorrectly), turns on a nicety of no practical utility. When a thunder-cloud explodes, it sends forth, at the same instant of time, two warning messengers,—the lightning-flash to the eye, and the thunder-sound to the ear. The flash travels, not quite, but almost instantaneously; the sound, at the rate of about 1,100 feet in a second. Of course, if the time which the sound takes to travel is counted from the instant the flash is seen, allowance must be made for the time which that flash took to reach the eye. This allowance, however, must always be too minute, to be worth taking into account in reckoning the distance of a thunder-cloud.

SATURN.—The "Fair Star Gazers" who have reminded us of the inquiry they addressed to us, on the 21st of April last, and which was inserted in our number of that date, are informed, that on mentioning it to one of the most eminent of living astronomers, he replied, that according to some observations recently made by Professor Struve, at Dorpat, Saturn is *not* "exactly in the centre of the rings," which are eccentric, instead of concentric; but that there are certain F.R.A.S. who contend that it is all an optical illusion, arising from the shadow of the planet being thrown on the rings.

Steam-Guns.—"Pyrotechnicus" has won his wager. The Steam-gun Exhibition in Adelaide-street is *not* the first of the kind by some half-dozen or so. Had the allied forces not been in such a hurry in 1814, Paris would have been defended by steam-guns prepared for the occasion; and long before that time, Mr. Watt had proved by experiment that nothing was to be gained by this

application of the power of steam. Mr. Perkins's appeal is from Gerard, Watt, and Wellington, to the mob of passers-by in the Strand!

The Hydrothionic Acid of the French author mentioned by "A Chemical Student," is a name given by the French chemists to our sulphuretted hydrogen in a liquid state.

MISCELLANEOUS GLEANINGS.

Black Leading, which has been applied with so much advantage to horological machinery, has lately been employed to reduce the effects of friction, on a scale of magnitude, and under circumstances, which can scarcely have fallen within the range of ordinary anticipation. Mr. Beamish's Little Paddy, of whose superior sailing capabilities we have repeatedly made mention, (Mech. Mag., 19th Nov. 1831, and 11th of August, 1832.) was beaten on the 13th of September by a quarter of a mile, in a run of fifty-five miles, by the Julia, built by Mr. Weld; and her defeat appears to have been in a great degree owing to the Julia being carefully *blackleaded* from the keel to the bends.

Hall's Rifle.—A new rifle has been introduced this year (in the United States) called Hall's patent; it loads at the breach, which is elevated for the purpose by touching a spring, when a flask with a double head, one containing powder, the other a magazine of balls, loads it expeditiously. It might be worth while to experiment with this rifle, as it saves the tedious operation of loading with the ramrod; and with a percussion lock, and a light rest in lieu of a ramrod, would (it is suggested) be an improved weapon for the British rifle corps.—*Correspondent, United Service Journal.*

Mining.—At the silver mine of Konigsberg, a gallery has been pierced through the side of the mountain, at the depth of 600 feet, through which the ore is now transported, instead of being hoisted to the top. Its length is 6,000 feet, and it occupied twenty-three years in its completion. The process was most tedious, being entirely by calcination and hammering, which brought the rock off in flakes. Only two men could work at a time; it was commenced both internally and externally, and it is much to their credit, that upon meeting there were only two or three feet difference on the level, and none in the direction. It is from six to seven feet wide, and from ten to fifteen in length.—*Foreign Paper.*

The Walthamstow Wooden-Spoon Maker.—I lately happened to meet with a very old and intelligent individual, in the neighbourhood of Walthamstow, who was represented to me by his daughter as being no scholar, and who found it convenient to employ his evenings in making one single article—wooden-spoons. Every evening in the year, when the evenings were long, he sat down, and with very few tools—a couple of gouges, a plain chisel, a bad file, and two or three knives—he sat down and constructed four spoons every evening, which he formed in a somewhat beautiful manner. You see to what a degree of perfection a mono-mechanic—a man who makes but one thing—can attain by directing his attention simply to the making of spoons. The old artist constructed them of different kinds of wood, all of our own country—some of the plum-tree, the barberry, (which in day-light is very beautiful) the pear-tree, and the cherry-tree. He makes four spoons every evening, which he sells at threepence each; and is visited every evening by many persons in consequence of these productions: (they are exceedingly convenient little spoons for tea-caddies, sugar-basins, and so on), and he feels himself that it is better to make a spoon than to be idle, and that if he were not sitting still making spoons, he might be sitting somewhere making mischief. He is besides a man of considerable natural taste: he is an entomologist, a butterfly-catcher; but he understands nothing more about them than their common names; yet he arranges them very beautifully: he has a very pretty cabinet of butterflies, and moths, and insects, and in the day-time is engaged in that pursuit. He entertains himself likewise in a garden, enjoys delightful health and spirits, and is a very interesting picture of a happy old man.—*Dr. Birkbeck: New Entertaining Press.*

Antipathy of Flies to the Magnet.—A singular anecdote is recorded in the Reichsanzeiger, a German periodical work. A person having an artificial magnet suspended from the wall of his study, with a piece of iron adhering to it, remarked, for several years, that the flies in the room, though they frequently placed themselves on other iron articles, never settled on the artificial magnet; and even that if any of these insects approached it, they in a moment again removed from it to some distance.

Magnetic Polarity.—A curious instance of the power of polarity is mentioned by Colonel Macdonald, son of the celebrated Flora Macdonald. This is the fact—that the uppermost part of the iron ring round a carriage-wheel attracts the north end of a magnet, and is consequently a south pole; while the lower part of the same iron, in contact with the ground, attracts the south end of the needle, and is, therefore, a north pole. Turn the same wheel round half a circle, and these poles are immediately reversed.—*United Service Journal.*

A Substitute for Paper Hangings has been invented in Manchester, and bids fair, as an article of upholstery, to command an extensive sale. In the spinning and manufacture of cotton it is well known that there are great quantities of fine waste, commonly called *flyings*. These have been collected, and by means of hydraulic-presses converted into a kind of thin cloth, which takes the *stain* equally well with paper, and is found to be a good and cheap substitute for that article on the walls of dwelling-houses.

New Mines of Gold.—A letter from Alexandria, in Egypt, dated August 12, states that M. Linani, a French traveller, has discovered a rich mine of gold in the mountains that run along the Isthmus of Suez. He conveyed nine chests of the ore to Cairo, some of which, on being smelted, rendered one-fifth of pure metal. The most productive of the mines of Peru do not afford a larger proportion. But these mountains do not supply any potable water, or any species of fuel, without which it will be absolutely impossible to work the mines. This was the principal cause of the abandonment of the emerald mines, which are supposed to have been formerly very productive.—*French paper.*

INTERIM NOTICES.

Our valuable correspondent, F. H., remarks, with truth, that Eli Whitney was "rather the Arkwright than (as we have said) the Watt of America."

The reply of "A Practical Engineer" to "Matter of Fact," has been unavoidably deferred, but shall appear in our next.

Communications received from Mr. Walsh—N.—Thoughtful—H. O. G.—Mr. Leigh—Mechanicus.—O. P. Q.—Baron Drais—E.

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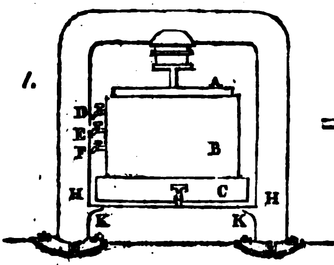
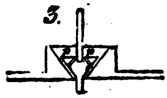
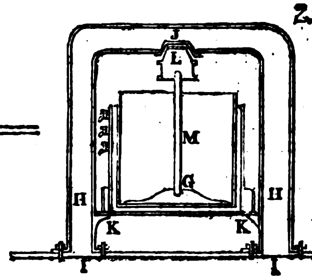
PLANS FOR THE PREVENTION OF STEAM-BOILER EXPLOSIONS.







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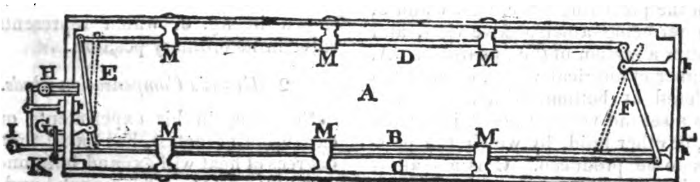
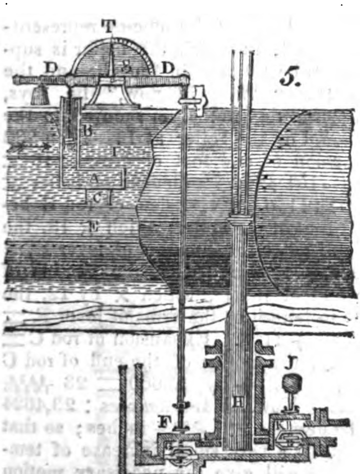
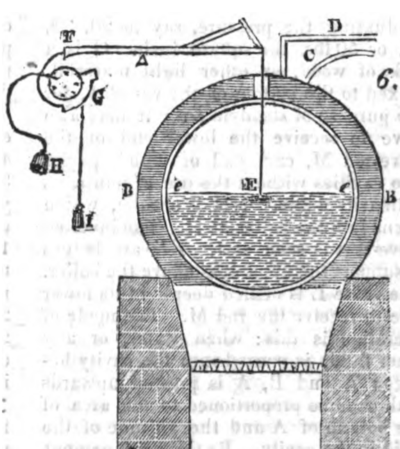






PREVENTION OF STEAM-BOILER EXPLOSIONS.

In consequence of the circular from the Committee of the Franklin Institute, appointed to investigate the causes of explosions in steam-boilers, published in the Mechanics' Magazine of the 4th Sept., 1830, a great many interesting commucations are stated to have been sent in to the Committee, and from time to time portions of them have been published in the Journal of the Institute. We intend to select from the preventive plans submitted to the Committee, such as are most distinguished for their originality or ingenuity, and for a commencement we present our readers with the following:—

1. *Ewbank's Hydrostatic Safety-Valve.*

The form of this safety-valve is the same as that ordinarily used, namely, a truncated cone; instead, however, of being pressed downwards, in the usual way, it is pressed upwards by the weight of a column of water, mercury, or other fluid, in the manner represented in the engravings in the preceding page, figs. 1 and 2, the former being a perspective view, and the latter a section of the apparatus. A, is an inner cylindrical vessel, open at top but closed at bottom, which is placed within a second vessel B, containing the water, or other fluid, by which the pressure is to be produced. C is a shallow vessel, in which B stands, and is intended to receive any fluid which may escape from B. DEF are cocks for regulating the height of the fluid, and consequently graduating the pressure, say to 20, 30, 40, or 50 lbs. the square inch. G is a disk of wood, or other light material, affixed to the bottom of the vessel A, for the purpose of steadying it; it may also serve to receive the lower end of the valve-rod M, each end of which passes into cavities without the use of joints, as ordinarily made. HH is a tube, which opens into the boiler at II. The inverted valve-seat is seen at J. KK are ledges to support the apparatus above the boiler. The valve L is drilled deeply in its lower side to receive the rod M. The mode of operation is this: when water, or any other fluid, is poured into the cavity between A and B, A is pressed upwards with a force proportioned to the area of the bottom of A and the altitude of the fluid in the cavity. By this arrangement he inventor thinks the danger which rises from overloading the safety-valve will be entirely obviated; for you have only to determine the extreme force of steam which shall be used in a boiler, and then to regulate the diameter of A and depth of B accordingly, which you may do with such exactness that the pressure cannot be exceeded *by the fraction of an ounce.* The cocks are merely to ascertain, when desirable, the force of the steam when below its maximum. Another advantage is, that when this valve is opened by an excess of steam, it cannot be closed (as the common valve may be) before that excess is discharged; indeed, the steam must subside a little *below* the extreme force before the valve can be closed again, because by the opening of the valve the vessel A is depressed, which expels a portion of the fluid out of B, so that the pressure on the valve is necessarily diminished in proportion to the quantity of the fluid expelled. To avoid, or, at least, to lessen, that sort of adhesion which is known to men of science as having been described by Mr. Clement, Mr. Ewbank drills a number of holes through the valve, as shown in fig. 3, which represents the valve in its ordinary position.

2. *Evans's Compensation-Rods.*

Smeaton, in his experiments on the expansion of metals, has found that 180 degrees of heat will expand iron, one foot in length, $\frac{151}{10000}$ of an inch, and that brass expands $\frac{232}{10000}$ of an inch. Mr. Cadwallader Evans makes this difference the groundwork of the scheme represented in fig. 4, in which the boiler is supposed to be 20 feet in length, and the rods 18. "We will now," he says, "suppose the rod B is secured to the back-end of the boiler at L. Then 232 expansion of one foot of brass $\times$ 18 $=$ 4176 $-$ 151 $\times$ 20 feet length of boiler $=$ 3020 $=$ 1156. Expansion of rod B beyond that of the boiler, which $\times$ 13, the ratio of length of the arms of lever E, $=$ 15028 $+$ 4176 $=$ 19204, the motion of the end of rod D, which $\times$ by 12, the ratio in length of the arms of lever F, $=$ 230448 $+$ 4176. Expansion of rod C $=$ 234624, the motion of the end of rod C at 1, which $\div$ by 10,000 $=$ 23 $\frac{4624}{10000}$ inches. Now, as 180 degrees : 23,4624 :: 10 degrees $=$ 1 $\frac{3034}{10000}$ inches; so that it appears a very small increase of temperature will give the necessary motion to open the cock H at the proper time; it can also be applied to regulate the damp-

er, to increase the supply of water, or to direct the water of the cold-water pump immediately into the boiler; it is also evident that we are not limited in the motion of the end of the rod C, but can arrange the machine so that one degree will give a motion of three or more inches. When the boilers are made of copper, the rods should be of iron; the motion of the rods would then be reversed by increased heat."

3. *Evans's Water-Regulator.*

A, fig. 5, is a small reservoir, containing mercury. B, a small cylinder, attached to A, in which is a piston. C is a part of the flue E, so arranged as to admit the fire to act on the bottom of A. The operation then will be, that, as the water settles, the top of A becomes uncovered; consequently, the heat is not carried off so fast, and the expanding mercury forces up the piston and gives motion to lever D; which, by its connections, as shown by the engraving, raises the stop-stem F, which allows the valve G to rise, and admits the water into the forcing-pump H; the motions are reversed when the water arrives at the proper height, as shown by the line J; by covering A, the temperature of the mercury is reduced, so that the piston descends, which causes the stop-stem F to approach nearer to the valve G, so as to prevent the valve from rising higher than necessary to admit a regular supply of water. J is a valve placed on the stem of the valve K, so that the engineer can at all times tell when the pump is in working order by the motion of the weight up and down; for should any thing be the matter with the pump, the weight will be stationary.

To indicate the temperature in the boiler, the brass plate S is graduated so that by the position of the index T, you can see the relative heat in the boiler.

4. *Ingham's Safety-Boiler.*

AA, fig. 5, is a steam-boiler, filled with water to the line *ee*. BB, a column of water on the outer side of the boiler, called a water-guard; it is confined by a casing of common sheet iron or copper, around the upper and middle parts of the boiler, meeting the fire at *cc*, and leaving a space of 2½ inches between it and the boiler for the thickness of the column of water. This water being exposed to the atmosphere, cannot be heated above 212°, and extending so far below the surface of the water within the boiler, that no part of the iron which has not water in contact with it shall be exposed to the fire, guards the upper and middle parts of the boiler from the intense heat communicated through the brickwork. C, is a pipe to discharge the overflowing water into the supply-cistern L. D, a pipe and pump to supply the water-guard. E, a concave spheroidal metallic ball, or float, so adjusted as to float as in the drawing, where the water is at *ee*. A slight depression of the water raises the catch F, when the lock-wheel G, propelled by the weight I, turns until the next notch meets the catch, ringing the bell H; a further depression of the water raises the catch, and the rack-wheel turns to the next notch, ringing the bell more actively; a further depression of the water raises the catch above the highest notch, when the weight I runs down, ringing the bell with such violence that it would be heard in every part of a steam-boat.

"The idea," says Mr. Ingham (late Secretary to the American Treasury), "of thus surrounding the boiler with an effective non-conductor, was suggested by reading some of the papers of Mr. Perkins, and a commentary upon his experiments by Mr. Arago; but the remedies proposed by the latter appear to be rather auxiliary than effective, and generally liable to the objection that they depend for success upon a degree of care and attention on the part of the engineer, which is scarcely to be expected, or even within the reach of hope in our country. It will certainly be safer to put it out of the power of the engineer to heat the upper part of the boiler to a temperature above that of the water, than to rely upon any precautions, which depend on his care and constant attention, to regulate it by any standard that can be devised."

Mr. Ingham having communicated his plan to Professor Renwick, the latter remarks of the water-guard (we think with a great deal of truth),—"As relates to that part of the improvement called the water-guard, there can be no doubt that it would be certainly effectual in preventing explosions arising from the cause pointed out by Perkins, but there are extremely few cases in which it would be possible to introduce it into practice; the water in the outer vessel boiling under

the ordinary pressure of the atmosphere, would not of course be heated beyond 212°, and would carry off the heat of the water and steam contained in the inner boiler so rapidly, that it would be impossible to raise their temperature more than a few degrees above 212°; now, even in the English condensing-engines, the safety-valve is loaded with three pounds per square inch, and requires steam of a tension greater than could be attained in the proposed apparatus; in our American steam-boats, even when the engine works upon the condensing principle, the safety-valve is rarely loaded with less than seven or eight pounds per inch."

ERICSSON'S STEAM-ENGINE AND WATER WHEEL.

Sir,—Mr. Busby, in appealing to your "intelligent and reflecting readers," ought, I think, to have left it with them to decide whether his objections to Mr. Ericsson's engine were refuted by my reply (Mech. Mag. of the 6th Oct. last); but since he has furnished a guide for their judgment by presenting a fresh statement—partly fallacious and partly of a nature tending to confuse the subject—I cannot refrain from making a few further remarks, in order to prevent all misconception of an invention, the principle of which will, in my opinion, bear the test of the most scientific scrutiny.

The objections, 1, 3, 6, and 8, having, as it appears, somewhat lost their original importance, it will only be necessary to notice them very briefly. The represented grinding has resolved itself into a very slow motion between the cone and plane (only 0·54 feet for each revolution), causing a friction particularly gentle, even more so than the friction between the gudgeon and its brass—the two surfaces being *both in motion in the same direction*, by which tallow, or any other greasy substance, will be carried between them with peculiar facility. The apprehended injury to the edge-packings of the wings will not take place, since it has been explained, that their ends never leave the chamber, and an equal wear is secured by their middle part bearing hardest against the chamber in passing between the apertures. The doubted analogy between the packings of this engine and a metallic piston stands thus:—there is in a piston of 4 segments always 4 *right angular spaces* between them, and these "angular" spaces get *wider* as the segments wear; in the rotary-engine there are also 4 right angular spaces between the packing-rings and the packings in the plane, and, as in the piston, they are filled up by right angular corner-pieces. The suggestion, that no test is so convincing as that of actual experiment, is very proper; still I have the "temerity" to contend, that if the pressure be proportioned to the speed, a smooth metallic surface will "bear" to be passed over another smooth metallic surface of a different material, at the rate of 20 miles per hour.

Mr. Busby's statement with regard to his original 2nd objection is nothing but a singular mystification of a plain subject, which was so clearly explained in my reply, as now to make further demonstration almost tedious. It was asserted, that 40,000 lbs. pressed against the plane; this I proved fallacious, because steam will get behind the plane, and there cause any "desirable counteraction." That the force of that steam will be about half of the working steam is evident, since it can get into the space and out of it with either an equal facility or difficulty —20,000lbs. I, therefore, assumed "to be unbalanced from behind." How erroneous, therefore, to assert that I had "overlooked the elastic pressure of the steam so admitted," and assume 40,000lbs. pressure, and why attempt to draw conclusions from such false data?

In the 4th objection it appears there is now a new feature, since the packings in the plane do not suffer by the *supposed* heavy drudge of the plane with its grinding, viz. their constant "alternating action" caused by the "varying width of the slit."

Mr. Busby, it appears, imagines that the sides of the wings must be plane surfaces, and the wings, therefore, every where equally thick; they have, however, not been described any where as such; and though it is not important to know what has caused the supposition, I must state that I happen to have viewed the drawing accompanying the specification of Mr. Ericsson's patent, and which being the full size, shows distinctly that the sides are curved or hollowed, which makes the wing thick where it joins the side of the cone as well as at its opposite edge, and that in consequence of this, it *fills the slit*, whether in a vertical or horizontal position. I need hardly add, that the thickness of the wing in the middle

(in the radial line) bears a proportion to the thickness at the edges = 307 to 325, this circumstance being evident to any one giving the subject a mature consideration. Thus we find that the assertion of the "alternating action" is quite unfounded, and that the wings will at all times be nicely "embraced" by the packings, without their having any motion at all in the plane.

In the 5th remark there is considerable importance attached to the fact, that a fly-wheel "forms no part of the machine as described." I agree that it forms no part of the machine, and also think the fact important, since the wheel will work any kind of machinery without one.

The "back-lash" in the pinion P is now said not to take place at a "slow motion," but that at a "rapid action it certainly would." I must confess that I do not know what increase of speed changes a slow motion into a "rapid action;" but notwithstanding this, I insist that the notion of back-lash in this engine is an absurdity, for how could any machinery attached to it run before it, unless there were a time when the engine was actually exerting *no available or useful power?* I refrain from advancing a proof, on account of the self-evident nature of the fact.

The stated "back-lash at the packings VV" in the plane is equally unfounded, but not being self-evident, it becomes necessary to ascertain whether the additional momentum given to the plane during that quarter of the revolution which changes the wings from a vertical to a horizontal position is so great that the consequent retardation during the preceding quarter revolution cannot be effected safely by the frictions of the packing-rings, &c., which counteract the motion of the plane. The plane being 39 inches in diameter, has its circle of equilibrium 13,8 inches from the centre, which makes the revolution = 7·2 feet; if, therefore, the engine makes 180 revolutions per minute, the plane being to the cone = 325 to 307, it will be found that 1·2 foot per second is the greatest acceleration of speed. Now, a body falling through the space of 0·0225 will attain a velocity of 1·2 foot per second, and the speed of the plane being nearly uniformly accelerated or retarded during one quarter revolution, or 1·8 foot, the analogy will be this, as 1·8 to 0·0225 = the weight of the plane (say half a ton, or 1120lbs.), to the required accelerating or retarding force; hence precisely 14lbs., constantly retarding the motion of the plane whilst the wings pass from the horizontal to the vertical position, will check all the momentum required during the preceding quarter of a revolution. But the friction of the packing-ring is nearly twice 14lbs., and, therefore, the represented "back-lash" against the packings VV is altogether imaginary.

The 7th remark, which originally conveyed the assertion, that the rotary-engine has "eight times the rubbing-surface" compared to an ordinary high-pressure steam-engine, appears to have been satisfactorily refuted, and the amount of the resistance caused to the engine by the rubbing-friction of the packings, is *now* said to be, at least, 8 times that of an ordinary engine. This assertion evinces about an equal degree of scrupulous attention to all combining circumstances, to that manifested on all the foregoing subjects; for when an estimate is made from "force, surface, and velocity, accurately taken," it will be found that the frictions of the packings of the rotary-engine bear a proportion to the power exerted by 45lbs. steam against its wing = 77 to 4686, that is, less than $\frac{1}{60}$th; therefore, if Mr. Busby's assertion were correct, the frictions caused by all the rubbing-packings of an ordinary steam-engine would diminish its power only $\frac{1}{480}$th part.

I am, Sir,
Your obedient, humble servant,
MECHANICUS.

London, Oct. 16, 1832.

BROWN'S GAS VACUUM ENGINE.

Sir,—Having been out of town during the latter end of August, I had not the opportunity of replying immediately to the paper signed "Matter of Fact," inserted in your Magazine of the 18th of that month. I should, however, have answered it before now, but on seeing the letter of "Honestus" in your Number of the 1st Sept., I was induced to defer so doing till I saw the replies of "Matter of Fact" or Mr. Brown, to his questions, some of which are very pertinent; although, certainly, that respecting the secret valve, to show the appearance of a permanent and steady column of mer-

cury, of great height, caused by the mere impetus produced by the explosion of the gas, appears like a rude attack upon Mr. Brown, and is unpardonable if not founded in truth. I was particularly desirous to hear this point answered, as I have myself been assured by a most respectable man that such is the fact. Like yourself, I am slow to believe it, yet I must confess I am still slower to believe, as asserted by "Matter of Fact," that Mr. Brown's gas vacuum is equal to 24 inches, or any thing near it. However rude the question of "Honestus" may appear, I think you will agree with me, that Mr. Brown is bound to answer it, appearing, as it does, in a public scientific work. If he can give a negative to it, surely he cannot hesitate; and if he do not answer the question, unfavourable conclusions must and will be drawn from his silence. Several of the other questions asked by "Honestus" deserve an answer, and do not possess the same apparent character of rudeness.

Had it not been for the propriety of making the foregoing remark, I should have premised my reply to "Matter of Fact" by observing, that his criterion of what constitutes a "Practical Engineer" is somewhat singular, and (if he be Mr. Brown under that assumed name*) somewhat tinctured with vanity. He says, "let him go to Eagle Lodge to see it, and he will then be more entitled than he now is to the appellation of a 'Practical Engineer;'" so that we must come to the conclusion, that no person can be a practical engineer who has not been to Eagle Lodge. It will no doubt, therefore, become as essential for those persons who aspire to that appellation to finish their education at Eagle Lodge, as it is to those who wish for diplomas, and the honourable appendages to their names of M. D., D. D., &c. &c. &c., to finish their education at the various universities.

"Matter of Fact" jumps at the conclusion, that I have not seen Mr. Brown's engine; for he says, "I will not follow your correspondent's example, who evidently has not seen Mr. Brown's engine by arguing upon it." I assure him, that he is mistaken, for I have seen Mr. Brown's engine, and heard him explain its principles. It is true, I have not seen it since the coke-oven has been applied to it, but I shall be most happy to accept an invitation from "Matter of Fact" to meet him, for the purpose of examining the fact, if (taking the hint thrown out by "Honestus") he will arrange with Mr. Brown to allow me to apply an indicator to his engine to enable us to ascertain what is the actual average amount of his gas vacuum in inches of mercury, without which all other criteria are unsatisfactory. I confess that I (like "Honestus") suspect it to be a very few inches; indeed, as to its being 24 inches, as stated by "Matter of Fact," I will pledge all the pretensions to the name I have assumed, that it is nothing of the kind. Does he not say that the pillar-engine (as he calls it) "is adapted only to raising water to any height not exceeding about 14 feet?" Pray is that equal to 24 inches of mercury? I do not doubt that the momentum caused by the explosion or (to use Mr. Brown's word) inflammation of the gas, will raise a portion of the water, but nothing near the whole contents of the cylinder, 14 feet high; and the same momentum may cause the mercury to jump up to 24 inches. But will it remain at that height for a moment without the ingenious device to prevent its descent, pointed out (no matter whether rudely or not) by "Honestus?" It is my decided opinion, that an indicator would prove that the average of Mr. Brown's gas vacuum is not equal to one-fourth of the column of 24 inches of mercury, as mentioned by "Matter of Fact," viz., not to a column of 6 inches. Does not the enormous size of Mr. Brown's gas cylinder prove what I say? If he had a vacuum of 24 inches, you will easily calculate what enormous powers his engine at Eagle Lodge and Croydon would possess. "Matter of Fact" states, that "Mr. Brown never asserted that his present plan of generating gas (query, generating heat?) by coke-ovens was peculiar to the generation of gas." I suppose that he will also admit, that the application of coke-ovens for generating gas itself is not *his* plan, as it was put in practice many years ago by Mr. Parkes, being, I presume, long before Mr. Brown thought of it. "Matter of Fact" says, "Mr. Surrey and Mr. De Jongh may have succeeded in the same method of producing heat, and if that heat is sufficient for steam-engines, it is a pity this plan is not generally adopted; that it is

* We know this not to be the case.—Ed. M. M.

not so, after more than eight years' trial, makes me suspect that there must be some radical defects in it." Is it not singular that "Matter of Fact" should use the above argument, and not perceive how peculiarly it also applies to Mr. Brown's gas-engine? Is it not true, that *it* has also had more than eight years' trial, and is it more generally adopted than Mr. Surrey's coke-ovens? If not, is there not equal ground for inferring "that there must be some radical defect in it?"

In conclusion, let me admire "Matter of Fact's" sapient and all-satisfactory remark respecting the panacea for the defects of Mr. Brown's gas-engine. He says, "When the water gas-apparatus, which he designates as such, is completed, it will *speak* for itself!!"

I remain, Sir,

Your most obedient servant,

A PRACTICAL ENGINEER.

Sept. 28, 1832.

P. S.—To the questions asked by "Honestus" I beg to add the following:—When the hot coke is taken from the coke-oven, what length of time does the fresh coal require to become sufficiently heated to cause the coal within the retorts to give out the gas? I suspect that, shortly after the retorts are again sufficiently heated to produce gas with any degree of rapidity, the coal in the oven will be sufficiently carbonised to be ready for extraction from the oven, and that it is only by letting the coke remain in the oven long after it is sufficiently carbonised, that even the plausible appearance of the plan being practical is preserved.

LABOURERS' COTTAGES.

Sir,—Having perused, with great pleasure, the remarks of several of your correspondents on the residences of the working part of the community, I have been induced to trouble you with the following observations on that subject:—

First, then, I would give my most cordial assent to the remarks made by T. M. B., on the proposal for forming a College for working men; for it is evident that previous to commencing an improvement in the condition of any class of men, you must convince them that the plan you propose is really an improvement. But it is beyond all doubt, that no working man would consider that as an improvement which went to destroy the comforts of his home for the sake of economy, and debarred him from freedom of will to promote a free circulation of air in his dwelling.

All projects for benefiting society, by congregating the working part in large barrack-like buildings, under the notion of economy or better ventilation, should be very cautiously considered. As to husbands and fathers, such establishments must be destructive of all domestic comfort and paternal intercourse. And, again, who can expect to find convenience in a residence of this nature, containing persons of different tastes, ages, and sexes, when each family would be liable to be annoyed by the brawls of fifty others—when one person wishing to retire early to rest would be prevented by the disturbances of others—and when he in his turn would annoy those who might not choose to rise as early as himself?

I think I have said enough to prove that we must seek for other means than these to carry into effect any "plan for the better housing of the working classes," and I am of opinion, that the best method would be the erection of small houses, capable of holding two, or, at the most, three families in towns, and cottages, on a plain and neat construction, for the agricultural labourers in the country.*

I have said that, with regard to towns, two or three families might reside in one house; this might be done without any sacrifice of comfort, and it would have the effect of causing a considerable reduction of rent to the inmates, arising from the expense of ground. In the country this does not apply, as the latter is there reduced to a sum comparatively insignificant.

With respect to the expense of those residences, no *general* estimate can be given, as the price of building varies so much in different places; but in London, I should consider that any person who would erect houses, containing six rooms, each about twelve feet square, might receive a fair interest on his money, with a reserve for repairs or future erections, by charging for two such rooms five shillings per week. This calculation does not include heating the rooms, for it is absurd to contemplate warming a poor man's dwelling by any other process than a fire within it; and I must think that the pro-

* With all due deference to T., and those that think with him, I should say that the road-side is the *very worst* situation in which these cottages could be placed.—J. W. H.

posers of other means can have but a very slight notion of the comforts of an "Englishman's fireside."

It would also be a most judicious plan if these houses could be erected in a situation more contiguous to the dwellings of the rich, instead of, as now, forming different districts of different classes of individuals. And it would surely be a preventive from envy, if the working men were to see their residences in the neighbourhood of those of the higher orders; and with what pleasure would a truly great man view from his splendid mansion the neat and lowly dwellings of his humbler fellow-subjects? Such a plan would call forth all the sympathies of human nature; the upper classes might learn humility, and the lower be kept from those degrading scenes which often occur in places *wholly* occupied by the poor; they would, in short, rise a step in the *moral scale* of creation.

Next, in regard to cottages for the agricultural labourer. I cannot agree with Mr. Loudon in thinking that such fanciful ornaments and architectural decorations as he would recommend are either useful or necessary. The dwelling of a working man should be indebted to his wife for the chief part of its *ornaments.* It is to the *conveniences* that I would give undivided attention; and *many* of these latter might be obtained at less cost than *one* of the former. There are few who would not look on plain *exterior* walls with pleasure if they found comfort in the *interior*, while they would contemplate with disgust an elegant outside, if it caused them to have *nothing but bare walls within.*

I am, Sir, yours respectfully,

J. W. H.

Sir,—Purposing to build some labourers' cottages, I shall be obliged to any of your architectural correspondents who will inform me whether, in pursuing a plan which has suggested itself to me, economy being my object, I have any *solid ground* to proceed upon; or whether I am merely building *castles in the air.* I will not at present occupy a larger space in your valuable pages than is sufficient to give an outline of my plan. If this is not shown to be impracticable—for I make no pretence to any knowledge of architecture—I shall beg to offer my further views on the subject. I propose that each cottage should consist of as many domes as rooms required; and here I know I shall at once be met by this objection, viz., the expense of a wooden centre on which to turn the domes; but I wish to know whether it would not be possible to build a dome of sufficient magnitude for a cottager's room without a centre. The Esquimaux (pardon me, ye Wyatts and Nashes!) build their huts in this shape with blocks of snow, forming the hemispherical dome by the eye only, with geometrical accuracy. Now, I would substitute for their building material, stone where easily obtained, or blocks of compressed earth, by shaping and laying them as here drawn. Although an English cottager would require a room of larger dimensions than an Esquimaux, I think the object might be effected. To assist still further in retaining the uppermost course of blocks in their places during building, wooden pegs (*aa*) should be inserted in the lower

surface of each block, fitting into corresponding holes in the upper side of the course last laid. I propose to carry the circular wall of each room straight up to about six feet, to shape the dome upon it by a piece of string (*b*) fastened to the top of a post (*c*) of the same height, fixed in the centre. The dome must be covered with a water-proof cement, for which see vol. xv. p. 79, of the Mech. Mag.; or thatched where straw is plentiful. It must be observed, no timber is required for roof or floors; no staircase; fire, also, is provided against. The height of the dome would allow cots or hammocks to be slung, with room sufficient for the bacon-rack above them. So that, in fact, one of these rooms would answer nearly all the purposes of two.

Several plans of machines for compressing earth are to be found in the

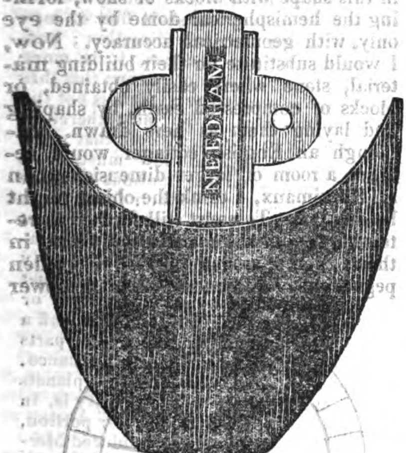
early Numbers of your Magazine; I should be glad to know if any of these were ever tried, and with what success.

Hoping very soon to see the opinion of practical men in your pages,

I am, Sir, your obedient servant,

A COUNTRY GENTLEMAN.

MUD-PROTECTOR.



Sir,—I enclose for your inspection (and if you approve of it, for insertion in your excellent work), an article which I think will be very useful in your dirty city. It is called a protector, and will be found to prevent the mud or dirt from rising into the trowsers of pedestrians. The part marked "Needham" is a box or socket, with a self-acting plug or spring, which goes into the heel of the boot or shoe, and may remain a fixture there and receive the protector when a gentleman walks out in dirty weather. Or when he rides, the protector may be removed, and a spur substituted. Specimens of these articles may be seen at Messrs. Deans, in Monument-yard. Your readers will at once perceive the utility of this protector when they consider that, in walking, it is from the top of the heel the mud arises. The protector being placed about an inch above, receives all the dirt, and keeps the wearer's trowsers perfectly clean.

N.

13, Coleshill-street, Birmingham,
Aug. 13, 1832.

REPORT OF THE FRENCH BOARD OF LONGITUDE ON THE APPROACHING COMET.

(Concluded from last Number, p. 37.)

From what I have said of the general tenuity of comets, those who fear the effects of one of them striking the Earth will derive some consolation; and in this we shall be fortified if we study the movements of those planets near which comets sometimes pass.

The comet of 1770 is the one which has hitherto passed nearest to us, according to known observations. Its smallest distance from the earth was 602,000 leagues—that is, six times as far as the Moon. La Place has shown that the action of the Earth on this comet augmented the period of its revolution by two days, and the re-action of the comet ought in like manner to lengthen the time of the Earth's revolution round the Sun; but observations have proved, that in 1770 the length of our year was not increased by one second. In fact, this comet twice traversed the space in which the satellites of Jupiter move, without causing amongst them the slightest alteration.

May a comet sometimes strike on the Earth, or on some other planet?

Planets revolve round the sun, according to some primitive law, all in the same direction, and in orbits approaching to circles. Comets, on the contrary, move in very lengthened ellipses, and in every direction. In coming from their aphelia, they constantly traverse our solar system; they pass within the orbits of the planets, and often they pass even between Mercury and the Sun,—therefore it is not impossible for a comet to come out and strike the Earth. Having thus admitted the possibility of a shock, let us hasten to declare that its probability is very small. —A mere consideration of the immensity of space in which our globe and comets move, and the small size of these bodies, will show this probability to be very small; but mathematics will go much further, and will give to us a numerical measure of this probability, calculated on the diameter of the comet compared with that of the Earth. Let us suppose a comet, of which we only know that at its perihelion it would be nearer to the Sun than ourselves, and that it should have a diameter equal to one-fourth of the diameter of the Earth; then the calculation of chances shows that it is 281,000,000 to 1 that these two bodies shall not meet, or, in other words, we have 281,000,000 to 1 in our favour; but in this calculation we have supposed to the comet a diameter far too large, and if we strike out the nebu-

losity, and calculate the chances on the nucleus only, we may multiply the foregoing chances in our favour by 10. This ought to tranquillize the most timid; and as to the comet of 1832, its orbit is known as well as is that of the Earth, and we have already shown where these two bodies will be when the comet crosses our orbit.

Do we find, in all we know of astronomical phenomena, any reason to suppose that comets have ever fallen into the Sun, or into any of the fixed stars?

The comet of 1680, at its perihelion, was only one-sixth of the diameter of the Sun from its surface. In a region so near this immense globe, the atmosphere which surrounds it may have a considerable density, and may produce on bodies passing through it effects which must not be neglected. This would be true, in particular, in regard to comets whose rapidity of motion at the perihelion is considerable, and whose density is inconsiderable. The necessary effect of such an atmosphere on the comet of 1680 would be to diminish its tangential or centrifugal velocity; but if any celestial body is retarded in its movement, and thereby loses part of its centrifugal force, the centrifugal counterbalancing force at once becomes the preponderating force, and the revolving body quits its curve to fall towards the centre of attraction. Thus, then, the comet of 1680 would pass nearer to the Sun in that year than it did at its former revolution; and as this approximation will be continued at each return to the perihelion, the comet of 1680 will end by falling into the Sun.

These reasonings rest on demonstrable mechanical principles; we must only admit that in our present ignorance of the density and arrangement of the solar atmosphere, as well as of the orbit and nature of the comet of 1680, it is impossible to calculate in how many ages the catastrophe I have alluded to will occur. The annals of astronomy give us no reason to suppose that any such event has taken place within the time of historical records.

Let us, however, go into the remotest times, and, considering the laws of our own planetary system, let us inquire if there be any thing in these laws which would force us to admit that a comet has, at some former period, fallen into the Sun.

All the planets circulate round the Sun from west to east, and in planes forming very small angles with each other. The satellites move round the primaries also from west to east. Moreover, wherever we have discovered a motion of rotation, both planets and satellites turn on their axes from west to east. We shall soon see how extraordinary this phenomenon is, by looking at the enumeration of all these similar motions.

Astronomers have observed motions of rotation in the Sun, in Mercury, Venus, the Earth, Mars, Jupiter, and Saturn; in the Moon, in the four satellites of Jupiter, in the ring of Saturn, and in one of Saturn's satellites, which gives a total of 16. If to these 16 motions of rotation we add the motions of translation of these bodies, as well as of those whose rotary motion has escaped notice, we shall find 43 motions all taking the same direction; but, by calculating the chances, it is more than four thousand millions to one that this disposition of our solar system is not the effect of accident. We must therefore come at once to the conclusion that some one primitive physical law must have been impressed on the motions of these bodies at the moment of their formation.

Buffon is the first who ventured to mount to the origin of the planets and their satellites, and to account for this similarity of motion. He supposed that a comet falling obliquely on the Sun, grazed or furrowed the surface of it, and drove off a quantity of fluid matter, the lighter parts of which, driven to the greatest distance, concentrated and formed the planets Saturn and Jupiter, whose density is, in fact, not great, while the heavier portion, driven to a less distance, produced Mercury, Venus, the Earth, and Mars, and that thus the planets were in their origin so heated as to be in a state of fusion, and that they then all took regular forms, and, in cooling, assumed the appearances we now see. Some of the objections which have been urged against Buffon's system might be answered, particularly those which object to the greatness of the mass to be driven off from the Sun by the supposed shock of a comet, for the whole of the planets and their satellites do not amount to one-eight-thousandth part of the mass of the Sun.

Celestial bodies, produced as Buffon supposes, would be endued in their motions of translation with that similitude which we remark in our planetary system; but it would not be the same in regard to their motions of rotation, for these might have turned in a direction opposite to the motions of translation. The Earth, for example, in performing her orbit from west to east, might, in possibility, have turned on her axis from east to west. This objection may be applied also to the satellites, the direction of whose motion is not of necessity the same as the motion of translation of their primaries. Thus, the hypothesis of Buffon does not meet all the

circumstances of the phenomenon. Hence it has not disclosed the secret of the formation of the planets, and hence we cannot come to the conclusion that the birth of our system was owing to a comet impinging on the Sun.

But modern discoveries have furnished other objections with which Buffon could not be acquainted. For instance, every solid body, say a cannon ball, thrown into space with a velocity sufficient to make it revolve as a satellite round the Earth, must, at each revolution, pass through the point from which it first departed, allowing for the resistance of the air. This may be shown from the first principles of mechanics. If, therefore, the comet of Buffon, in striking the Sun, had driven off from it solid fragments which became afterwards our planets, this comet must at each revolution have returned to its original point of departure,—that is, must have brushed against the surface of the Sun, where it had before impinged; but every body knows that this is not the case. Moreover, Buffon adopts as a condition that the masses driven off from the Sun were hot, and in a state of fusion; and hence the exterior of the sun, at least, must be conceded to be in a state of liquefaction; but the most minute modern observations have by no means confirmed this idea: on the contrary, the rapid changes in the form of the solar spots, both luminous and dark, have of late years led us to suppose, with great probability, that these phenomena take place in a gaseous medium; and now the experiments made at the Observatory at Paris on the polarization of light have established this incontestably; but if the exterior and illumined part of the Sun be a gas, then the system of Buffon fails in its most essential fundamental point, and is no longer sustainable.

It might, indeed, be urged, that the dark body of the sun within, which this luminous atmosphere surrounds, and which we occasionally see when the surrounding atmosphere opens—it might be urged, I say, that this central dark body is liquid; but this would be quite a gratuitous assertion, wholly unsupported by accurate observation.

To sum up, and this is the object of this chapter, nothing proves, whatever Buffon may say, that "the planets formerly made part of the Sun, from which they were separated by a common impulsive force, which still acts on them." Thus, then, nothing establishes the opinion that a comet had any share in the formation of our planetary system; nothing indicates, in short, that in the beginning of things a comet had fallen into the Sun.

Pliny tells us, that in the time of Hipparchus (about 2,000 years ago), a new star appeared, all on a sudden, in the north, which first gave to that astronomer the idea of forming a catalogue of stars. The same phenomenon was observed in 1572, and in 1604.

The new star of 1572 appeared in the north on the 8th of November, in the constellation of Cassiopeia. It was more brilliant than Sirius, and shed almost as much light as the planet Venus. The star of 1604, when seen by the pupils of Kepler, on the 30th September, at mid-day, was brighter than Jupiter, although, only the night before, this new star appeared very small. At the end of 16 months this star was no longer visible. The new star, in Cassiopeia, was visible for a year and a half.

The fixed stars seem to be real suns, round which, in all probability, planets and comets circulate. From what I have just stated, we may conclude, that in the heavens there are some stars which, being exhausted, have become dark from being extinguished. Newton believed that stars of this sort become incandescent, and recover their former splendour when comets fall into them, and furnish fresh fuel; but the great name of Newton must not hinder me from remarking, that, in comparing the incandescence of the heavenly bodies with that of ordinary fires, making comets act, as it were, the parts of logs of firewood in a chimney, he pushed much too far the laws of analogy. In the present day, every body knows that almost all bodies, under certain special conditions, particularly in certain states of electricity, may be rendered luminous, without any thing combining with their substance, and without any thing being disengaged from it. Such is the case, indeed, with two pieces of charcoal placed in a vacuum, of which one touches a wire issuing from one pole of a voltaic pile, whilst the other communicates with the opposite pole of the same pile; for, as soon as the surfaces of these bits of charcoal are brought very near each other, they become more resplendent than all other known terrestrial fires, and to such a degree, that it has been agreed to call the light emanating from them "solar light." I do not say that this proves that the light of the sun and of the stars is electric, but at least it will be granted that the contrary is not proved; and this is enough to place amongst mere hypotheses, Newton's reasonings in support of his doctrine of comets falling into the sun.

May the earth pass through the tail of a comet? What would be the consequences of such an event on our globe?

Newton thought that the exhalations of which the tails of comets are composed, might fall, by their gravity, into the atmospheres of planets in general, and into that of the earth in particular; and there, being condensed, give rise to all sorts of chemical re-actions and combinations.

A few words will be enough to prove, I will not merely say, that cometary matter may fall into our atmosphere, but that this phenomenon is of a nature to occur frequently.

Comets appear, generally, to be little else than simple aggregations of vapours; but, as it is known that attraction is in proportion to the mass, each molecule of the tail of a comet must be very feebly attracted by the body of the comet; and this attraction diminishes as the squares of the distances. Thus, when the distance of a particle from the head of the comet is very great, the attraction must be scarcely sensible. But some comets have tails of immense lengths; for instance, the comet of 1680, whose last visible molecules were 41,000,000 of leagues from the nucleus.

One may comprehend, then, that a planet, the earth, for example, whose mass is often so superior to that of comets, may attract to herself the extreme parts of comets' tails, although at a considerable distance from them; and the introduction into the terrestrial atmosphere of a new gaseous element, may, according to its quantity, either destroy all animal life, or cause epidemics; and thus many authors have attributed to this cause the most part of those epidemic scourges which history has recorded.

The total number of comets which have been recorded, beginning at the Christian era, is about 500. At present, when the heavens are watched with attention, the medium number of comets seen in a year is rather more than two. This frequency of their appearance would cover, or apply to most of the epidemics people might be disposed to impute to comets.

(Mr. Arago here enters into a train of reasoning, to prove that certain fogs which have overspread the earth, and in particular that the great fog of 1783, were not tails of comets.)

Was the deluge caused by a comet?

The numerous and important geological observations for which we are indebted to modern naturalists, prove, beyond doubt, that certain regions of our globe have been successively, and at different times, covered and abandoned by water. In the explication of these cataclysms, people have too often had recourse to comets, for me to refrain from saying a few words on this subject.

Amongst others, Whiston, in his *New Theory of the Earth*, not only endeavours to show how a comet may have caused the deluge of Noah, but also to explain thereby all the phenomena of the Mosaic account of that event.

The Mosaic deluge took place, according to the modern Hebrew text, in the year 2349 before Christ, or in the year 2926, according to the Septuagint, Josephus, and the Samaritan text. Let us then consider if, at either of these periods, any great comet was visible.

Of all these bodies which modern astronomers have observed, we must at once place in the first rank, as to splendour the comet which appeared in 1680.

A great number of historians have mentioned a comet which was very great, imitating "the light of the sun, and having an immense tail," and which appeared in the year 1106.

In going further back we find "a very large and a very terrifying comet," designated by the Byzantine writers under the name of "Lampadios," because it resembled a burning lamp. This comet appeared in 531. Lastly, every body knows that a comet was seen in the month of September, in the year of Cæsar's death. This comet was very brilliant, and was seen by daylight. The date of this comet is 43 years before our æra.

Since we have no exact observations of these comets, neither in the year 43, nor in 531, nor in 1106—since we have no means of calculating their parabolic orbits—since we are without the only criterion which enables us to pronounce with an entire certainty on the identity or the non-identity of 2 comets, let us, however, recollect, at least, that the comets of 1680, of 1106, of 531, and of 43, B. C., were all very brilliant, and let us also compare the several states of their appearances.

Before Christ, from 23 to 531, is 575 years.
——— from 531 to 1106, is 577 ditto.
——— from 1106 to 1680, is 574 ditto.

As we do not take into account the fractions of years, these periods may be considered as equal to each other, and therefore it becomes tolerably probable that the comets of the death of Cæsar, of 531, of 1106, and of 1680, were no other than the re-appearance of one and the same star, which, after having completed its orbit in about 575 years, became again visible to the earth. Now, if we multiply this period of 575 years by 4, we shall have 2,300, which, added to 43, which is the date of Cæsar's comet, we are brought back, with the difference only of six years, to the epoch of the deluge, according to the modern Hebrew text, and on multiplying the same period by 5, we

find the date of the Septuagint, with the difference of only eight years.

Whiston, in his theory, required an immense tide to explain the phenomena related in the Bible of the great abyss; he therefore was not content merely to make his comet pass very near to the earth at the moment of the deluge, but he has also given to it a considerable mass, and he supposes the comet to be six times greater than the moon.

Such a supposition is quite gratuitous, but that is not its least fault, for the supposition is not sufficient to explain the attendant phenomena; for if the moon produces such great effects, as she does, on the ocean, it is because her diurnal angular motion is not considerable; it is because her distance from the earth scarcely varies in many hours; it is because the moon corresponds vertically with nearly the same points of the globe during a considerable space of time; it is because the fluid which she attracts has always time to yield to her action, before she moves on to a region from which her force will operate in another direction. But this was not the case with the comet of 1680; near the earth its apparent angular motion across the constellations was extremely rapid; in a few minutes this comet corresponded with a number of points on different meridians of the earth, placed at a great distance the one from the other. As to the distance of the comet from the earth in a straight line, that, no doubt, may have been very small; but then this lasted only for a few minutes. These circumstances taken together are very unfavourable for the production of a very high tide. I am aware that to meet this difficulty we have only to enlarge the comet, to make its mass no longer 6 times that of the moon, but 30 or 40 times; but, I answer, we have not this liberty as far as regards the comet of 1680, in which year it passed very near the earth; but as in that year it produced neither heavenly cataracts, nor internal tides, nor breaking up of the great abyss; as, moreover, neither its tail nor its head of hair inundated us, we may confidently pronounce the theory of Whiston to be a mere romance,—unless, abandoning the comet of 1680, we attribute the part it was to play, to another comet much more considerable.

His celebrated countryman, Halley, had, however, looked on this subject in a less confined manner. Halley, instead of supposing a comet passing so near the earth as to cause a very high tide, supposes a comet striking perpendicularly on the earth.

Let us suppose a solid body moving in a right line with a certain rapidity, and that an insurmountable obstacle shall be placed suddenly, all at once on the route of this body, so as to stop it instantly. Let this happen to our earth, the tangential rate of translation of which is eight leagues in a second, and let this effect be produced by a comet of sufficient mass, all bodies resting on its surface, such as animated beings, our carriages, our furniture, our utensils, all objects, in short, which are not fixed to the ground, would fly towards that point of the earth on which the comet had struck, with the rapidity which had been communicated to them by the earth's motion—that is, with a rapidity of eight leagues per second! One may imagine, at once, what would be the effect of such an event, when I state that a cannon-ball of 24lbs., even at its first departure from the mouth of the gun, moves at only 1,200 feet in a second; in a word, every animated being would be annihilated in one instant!

As to the waters of the ocean, as they are moveable, and as nothing binds them to the solid part of the earth, they would be thrown forward in a mass towards the point of percussion. This frightful liquid mass would overturn, in its impetuous course, every object it met. It would rise above the tops of the highest mountains, and, in its reflux, its effects would be hardly less. The disorder which we now remark here and there in the disposition of certain strata on the crust of our globe is, one may say, but a microscopic accident compared with the frightful chaos which would result from the direct shock of a comet, sufficiently large to stop, at once, the earth in its orbit. But another effect would at once result, which would be that the centripetal force being no longer balanced by the centrifugal, the earth would at once begin to fall towards the sun, into which she would fall in 64½ days after the shock.

But, taking this shock of a comet under any circumstances and modifications, it is incontestible that the inundations to which such an accident would give rise would not explain the phenomena which have been remarked by geologists, and the effects produced by cataclysms on our globe.

But let us suppose by the above, or by any other cometary influence, vast portions of the continents inundated, and lofty regions buried under water, is it by a violent change such as this that the marine deposits which have been discovered on mountains have been placed there? These deposits are frequently horizontal, very extensive, very thick, very regular. The variegated shells, often very small, which

compose these layers, often preserve their projections, their most delicate points, their most fragile parts. Every thing shows the impossibility of a violent transportation—every thing proves that the deposit has been made quietly on the spot. What remains, then, to be said, to explain observed geological phenomena, without having recourse to a violent usurpation of the ocean? We must come to the conclusion that the mountains, as well as the elevated grounds which serve them as a base, have been pushed upwards from below and from under the waters which once covered them. In 1694, Halley brought forward this hypothesis as a possible explanation of the presence of marine animals on the sides and tops of high mountains. This explanation was the true one, and it is now universally admitted. A comet which should materially change either the motion of rotation or the motion of translation of the earth would produce, no doubt, tremendous overturnings on the crust of our globe; but, we must repeat it, these physical revolutions would differ in a thousand circumstances from those which have been noticed by, and which at present form the study of, geologists.

Ceres, Pallas, Juno, and Vesta—are these the fragments of a large planet which has been broken by the shock of a comet?

Planetary astronomy has been enriched since the beginning of the present century by the discovery of four new planets, which, not being visible to the naked eye, were unknown to ancient observers. These stars have been called, Ceres, Pallas, Juno, and Vesta. Their orbits are all between the orbits of Mars and Jupiter.

Two of these orbits, those of Ceres and Pallas, are nearly equal. The orbit of Juno, and particularly that of Vesta, are much smaller. The four curves, although in different planes, are interlaced. They appear to have originally had similar elements—in short, every thing leads us to suppose that these planets, at each revolution, passed formerly through the same point of space.

This circumstance would be, doubtless, very extraordinary, if Ceres, Pallas, Juno, and Vesta, had always been independent of each other; but it will become very simple if we regard the four planets as fragments of a larger one, which one day was broken into pieces. In fact, a planet, properly so called, follows constantly the same route, allowance only being made for perturbations. At each revolution she passes through the same points; but from the instant in which, according to our hypothesis, the large planet was broken, each of its fragments became in every sense of the word a real planet, which began to describe the curve along which its movement was to be directed for ever. Some difference of intensity and direction amongst the forces which projected the different pieces, caused notable differences in the forms and in the position of the orbits, but all these eclipses must have a common point—that is, the point at which the planetary fragments separated to take their several routes. The common point, therefore, which the orbits of these small planets appear to have had formerly, shows pretty clearly that formerly these four bodies formed but one.

This theory on the common origin of these four planets was assented to generally; but disagreement arose amongst philosophers, when it became necessary to assign a cause for the splitting of the great planet. Some, having recourse to internal gases and commotions, supposed the outer crust of the great planet to be burst, and thus Ceres, Pallas, Juno, and Vesta, to be formed. Others reject this doctrine of internal explosion, and declare that a heavenly body can be broken only by the striking of a come

It would be difficult to find, in the form and aspect of the four little planets, unanswerable arguments for either of these hypotheses. I will, however, give some singular reasons on which the advocates for a cometary shock rest.

In the larger planets, Mars, Jupiter, and Saturn, we see some traces of an atmosphere, but they are traces only, and can be seen only by the aid of powerful glasses: in the planetary fragments, atmospherical phenomena are visible on an immense scale. The atmosphere of Ceres is no less than 276 leagues deep; that of Pallas 192 leagues. Hitherto comets alone had gaseous envelopes so large! Well, then, let us suppose, as people have said, that the large planet which moved between Mars and Jupiter was broken by a comet, and all will be explained! The cometary atmosphere, or nebulosity, not having been destroyed by the stroke, will have naturally been divided amongst the different fragments, and will have formed round each an immense atmosphere.

This theory is ingenious, but unhappily a striking fact comes and contradicts it. Vesta has hitherto afforded us no traces of an atmosphere: but what cause could have thus disinherited Vesta of the share of the atmosphere of the comet, when it was to be divided amongst the planetary fragments?

INFLUENCE OF THE COMET ON THE WEATHER. BY MR. HEREPATH.

(From a Letter to the *Times*.)

I have been repeatedly asked, whether our late unseasonably hot weather may not be owing to the approaching comet? If we may attribute it to any comet, it seems more reasonable to affiliate it on some comet that has appeared, and passed us, than on one which has hardly yet arrived. Encke's comet of this spring is much more likely to be the cause. On this point, namely, the influence of comets to affect the temperature, M. Arago has made some researches in the work above cited; the result of which is, that comets have no effect in altering the mean annual temperature of the earth. Granting to M. Arago the full benefit of his inference, it by no means follows that they may not have a powerful influence on the seasons, separately considered, though they may have none on the mean temperature of the year. For example, let us suppose, that one was by any means rendered uncommonly clear, or uncommonly cloudy for a whole year, what would be the consequence? Would not the summer temperature, in the former case, be considerably elevated, and the winter as much depressed; and the contrary, in the latter case; yet the mean temperature, in both instances, would be the same. Suppose, then, that in a comet's route through the heavens, some of its atmosphere, fully retained about it, were dispersed by the impulse of the sun's rays or otherwise, and collected into our's by the earth's attraction, as it afterwards passed near; might not this new matter, in fact, is it not probable it would affect our atmosphere, so as to render it more clear or more turbid, and consequently produce all the effects we have hinted at? History furnishes us with numberless instances of the great atmospheric changes which have accompanied or succeeded the apparition of large and notorious comets; and unless we reject altogether its often iterated testimonies, I do not see how we can refuse or assent to influences so manifest, and yet so simple and perfectly philosophical. That comets may produce very sensible effects in the way alluded to, not only in the meteorological state of the air, but in its salubrity, our best philosophers admit; but these effects must always be concurrent or posterior—never, I apprehend, anterior to their appearance. With this view, it is not improbable but that the unusual state of the air last year, and the disease which is now ravaging so many parts, may owe their origin to the large and brilliant comet which ushered in the year 1831.

ANSWERS TO INQUIRIES.

SLEEPING AT LECTURES.—" If the Correspondent, who sometime ago inquired for some innocent chemical preparation, to keep him awake during lecture time (See Mech. Mag., 28th July, 1832) will make use of what is called *Violet Strasburgh*—a sort of snuff, with scarcely any snuff in it—he will perfectly find that it will answer his purpose."—F. W. M. Clifton, 28th Sept. 1832.

DIPPELS OIL was a sort of quack medicine, employed a good many years ago in fevers, and was so called after the apothecary who introduced it. It differed little, we have heard, from common hart's-horn.

ASSAY MARKS.—Gold of the money standard, contains only one part in twelve of alloy; jewellers gold, three in twelve. It is only wrought articles of the former standard, which are marked with the Lion.

PAINTING IN SAND.—Sir, I have reason to believe that —— Claxton, Esq., West Cowes, Isle of Wight, can give your Correspondent, "Tranquil," (p. 47), some instruction in the process of arranging the Alum-Bay sand, for pictorial representation. Mr. Claxton is said to be the inventor; he is a very benevolent person, and devotes a considerable portion of his time to the art, appropriating the produce entirely to charitable purposes, to the amount. I am told, of a very considerable sum per annum The sand is adjusted by means of a small piece of wood, shaped like a skewer; the pointed end serves to regulate the position of the sand as it is gradually dropped into a glass frame prepared for it, and the blunt end to ram it down with. It is doubtless an art requiring great delicacy and perseverance. I am not aware of the method by which correctness of outline is ensured, but should suppose that after a frame is prepared, with a narrow space between the backboard and the glass, the outline is traced on the glass, as a guide for the main features of the picture, and the subordinate parts are filled in by the eye. Perhaps a Camera Lucida might be used to advantage, having first made the glass semi-transparent, by means of some composition easy to wash off, so as to give it the power of a faint reflection.—I am, Sir, your obedient servant, SAMUEL DOWNING, Cabinet-maker, 8, Aldersgate-buildings, Oct. 23, 1832.

LIVERPOOL WARE:—R. P. M. wishes to know what is the sort of pottery known by this name? We were not before aware that Liverpool had given its name to any thing in this branch of art; and think it likely that our correspondent's inquiry is founded on a mistake, arising from the circumstance of the art of tranferring copper-plate engravings to pottery ware (called, at first, black printing) having been first invented by a journeyman-engraver of Liverpool, of the name of Carver, and first practised on a large scale at that place, by the inventor's employers, Messrs. Sadler and Green.

MERIDIANS OF LONGITUDE—" Castor's" inquiry (which is the proper meridian?) resolves itself into this—At what point of a circle does the circle begin. It is certainly very desirable that all nations should fix on one common meridian; but we can hardly hope to see that accomplished, till all nations arrive at the still remote discovery, that all nations have but one common interest.

EDUCATION IN AMERICA.—"A Returned Emigrant," who accuses us of "foreign-fangled notions" in uniformly representing that there is a great deal more attention paid to the education of youth in the United States than is Great Britain, puts the following questions:—"1. Do you consider going to school, as I should rather say having the priviledge to go to school and *not* going, the same thing as receiving a good education?—2. Is it not a fact that in a great many of the towns (those of New Jersey for instance, of which I might, if I chose, speak from personal knowledge,) the greater portion of the children never attend the schools provided for them?—3. Are you not aware that societies for the "Promotion of Public Schools," have been formed in several of the States, on the distinct ground, that there is a lack of such schools; and that even in Pennsylvania, which ranks as the most enlightened of all the states, the average proportion of children educated, is but one in three? To these questions we make answer, that we have never mistaken the mere nominal establishment of schools for the matter of education itself, and were certainly not aware of the facts, if they be facts, to which our Correspondent alludes. We shall never be found willingly aiding in giving currency to any delusion whatever, and shall cheerfully give insertion to any authentic information on the present subject, which "A Returned Emigrant," or any other of our readers, has it in his power to supply.

Cometary Blunders.—The Useful Knowledge Society informed the public, through the medium of their "Penny Magazine," that the comet would on the 22d of this month (October) be nearest to the earth, and at the distance of about 44,000,000 miles from us. The Christian Knowledge Society affirmed in their rival penny affair, "The Saturday Magazine," that the "nearest approach to the earth would be on the 25th of this month (October) when it would be about 51,000,000 of miles distant from us." The judicious may see from this of what advantage it is to have "knowledge" dealt out to the people under the "superintendence" and direction of great corporate associations. On a point, about which there ought not to be the smallest difference among persons competent to treat of an astronomical subject, not only do these societies differ to an extent that is quite prodigious, but neither of them come near the truth by several millions! As far as we are aware, the only individual instructor of the people who has erred in the matter to the same extent as these corporate blunderers, is Mr. Pinnock the editor of the "Guide to Knowledge," according to whom the nearest approach was to be on the 22d of October, and the least distance about 55,000,000 of miles. What renders these blunders more surprising—indeed inexcusable—is, that the calculations of Damoiseau and Arago, showing that the real time of the comet's nearest approach would be neither the 22d nor the 25th, but the 29th of October, a little before midnight, and its nearest distance upwards of 60 millions of miles, have, for a twelvemonth at least, been known to the whole scientific world.

Altitude of Atmospheres.—Mr. Herepath states, that in a work on which he is engaged he has been able "to demonstrate that the quantity of atmosphere has nothing to do with its absolute height, but that this depends, other things alike, on the temperature and dimensions of the body enveloped with the air; generally the smaller the body the higher the atmosphere. Thus, were our moon surrounded with such an atmosphere as ours, it would be four times as high as the Earth's, or above 120 miles; while on Jupiter it would scarcely reach half a mile, and were it of the levity of hydrogen, it would then ascend to not more than about 7 miles on Jupiter."

LIST OF NEW PATENTS GRANTED BETWEEN THE 20TH OF SEPTEMBER AND 20TH OF OCTOBER, 1832.

Charles Watt, of Clapham, surgeon, for a new or improved method or process of preparing tallow and stuff from fatty materials and refining the same for the manufacture of candles and other purposes, Sept. 27. To inrol within Six Months.

Joseph Amies, of Loose, Kent, paper-maker, for certain improvements in the construction of apparatus to be employed in making paper. Sept. 29. Six Months.

John Travis, the younger, of Shaw Mills, near Manchester, cotton-spinner, for certain improvements in machinery for roving cotton and other fibrous substances. Sept 29. Six Months.

William Palmer, of George-place, Old-street-road, candle-maker, for improvements in making candles and candlesticks, or an apparatus for holding candles. Sept. 29. Six Months.

John Joyce, of Sidmouth-street, Gray's-inn-road, gentleman, for a certain improvement or improvements in machinery for making nails. Communicated to him by a certain foreigner residing abroad. Which invention he believes will be of general benefit and advantage Sept. 29. Six Months.

John Swan, of Basingstoke, brewer, for certain improvements in brewing. Sept. 29. Six Months.

Sherman Converse, of New York, at present residing in Ludgate-hill, in the city of London, gentleman, for certain improvements in making or manufacturing metallic rails for the construction of railroads. Communicated to him by a certain foreigner residing abroad. Sept. 29. Six Months.

Joseph Gibbs, of Kent-terrace, Kent-road, Surrey, engineer, and Augustus Applegarth, of Crayford, calico printer, for certain improvements in steam-carriages. Sept. 29. Six Months.

John White, of Southampton. engineer and iron-founder, for certain improvements in the construction of pumps or engines for raising water or other fluids. Oct. 10. Six Months.

William Woods, the elder, of Newcastle-street, Farringdon-street, London, steel-pen manufacturer, for a certain improvement or improvements in the construction of metal pens. Oct. 10. Six Months.

James William Durant, of Brewer-street, Somers' Town, St. Pancras, smith, for an improved mode or modes, method or methods of securing, combining, and preserving printed, written or plain papers, prints. drawings, music, or other similar matters, so as to be readily accessible, easily referred to, and capable of being taken asunder and replaced at any time with facility. Oct. 12. Six Months.

INTERIM NOTICES.

The Supplement to the preceding Volume, containing Titles, Preface, and Index, with a Portrait on steel of Eli Whitney, is now ready, price 6d. Also the Volume complete in boards, price 8s. 6d.

There is a good deal of force in what "A Countryman" says in justification of the attention paid to furniture in Mr. Loudon's Encyclopedia of Cottage Architecture, and we shall not deny him the hearing which he claims. We must, however, observe, that we never disputed the value of the information which Mr. L. has furnished on this head; we questioned only the propriety of including furniture under the head of "Architecture"

Communications received from Animo—Mr. Woollgar—Anti-Mock—Velox—Mr. Jackson—O. R. —An Architect and Engineer.

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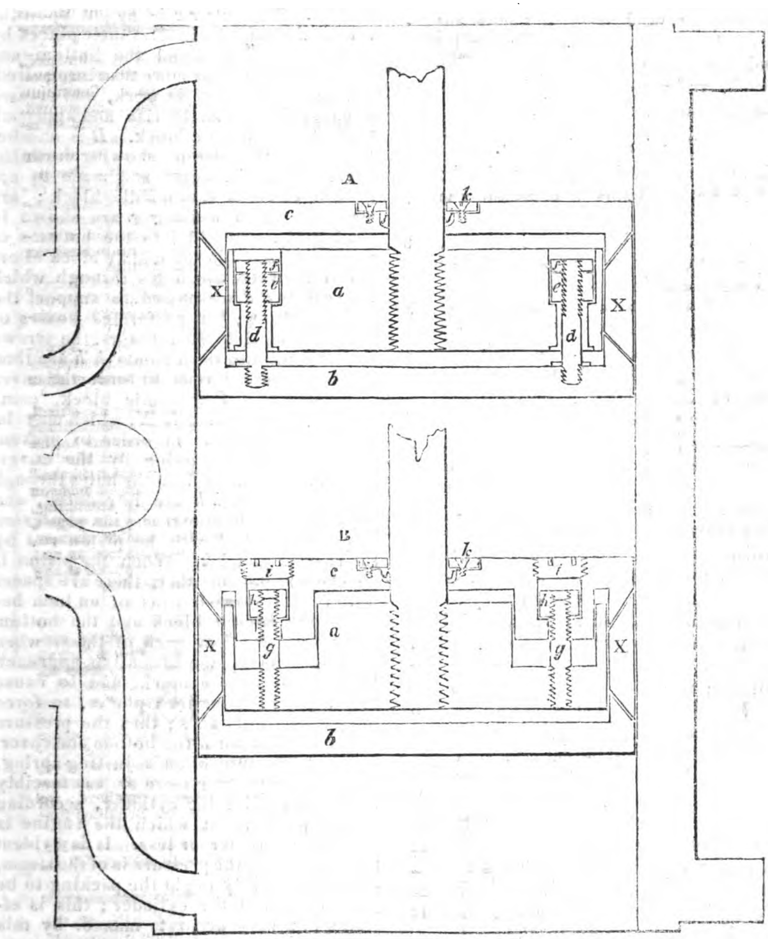
HALL'S IMPROVEMENTS IN STEAM ENGINES.



MR. SAM. HALL'S IMPROVEMENTS IN STEAM ENGINES.

Patented 22d December, 1831; *Specified 22d June*, 1832.

The improvements of Mr. Hall may be conveniently classed under two distinct heads. The *first* includes an improved piston and valves, and an improved mode of lubricating engine pistons, piston rods, and valves; the *second*, an improved method of condensing the steam, and supplying water to the boilers of such engines as are worked by a vacuum produced by condensation. We shall this week confine our attention to the former branch, and reserve a description of the latter for our next Number.

The Improved Piston.

The great disadvantage of the hemp and gasket packings in common use is, the impossibility of keeping them steam-tight for any considerable length of time; they must either be renewed frequently, or a considerable loss of power from the escape of steam must be put up with. A complete remedy for this evil was supposed to be found in the metallic pistons of Cartwright and Barton, where the office of the packing is performed by a metallic ring, which is kept in a state of constant adjustment to the cylinder, by being divided into segments, and these segments pressed outwards by springs; but it has been found in practice, that when there is the least excess in the outward pressure of such segments (a thing difficult to prevent), they are apt, being of a hard nature, to abrade the cylinder, and thus to substitute a permanent injury for a temporary inconvenience. Mr. Hall now proposes to combine the two methods; that is to say, to revert to the old hemp and gasket packing, and to maintain a constant steam-tight adjustment of it to the cylinder, on a principle similar to that exemplified in the case of the metallic pistons, but solely through the agency of the steam itself; an arrangement which offers this obvious advantage, that, as the packing materials are of a soft description, the pressure may be always somewhat over the mark, without any injury being done to the cylinder. It is proper to state, that though this is the light in which a perusal of Mr. Hall's specification induces us to view his improved piston, the patentee himself makes no allusion to what has been done by others before him, but gives simply a description of his own improved method, which description we shall here insert in his own words:—

"My improved piston consists of three parts; viz., a middle block, a bottom, and a cover. *A A* is a section of the piston, showing how the bottom is suspended from, and attached to, the middle block; *a* is the middle block, *b* the bottom, and *c* the cover; the bottom is attached to and suspended from the middle block by six screws, two of which *d d* are shown in section. The nuts *e e* being put upon the screws *d d*, and secured in their places by lock nuts *f f*, suspend the bottom and prevent its lowering more than is required, but allow it when at work, and pressed upon by the steam, to rise and approach towards the middle block. *B* is another section of the piston, showing how the cover is brought down and made to approach towards the middle block; six screws, two of which *g g* are shown in section, are screwed into the bottoms of recesses formed in the middle block alternately between the holes through which the screws *d d* are passed to support the piston bottom; the perforated bosses of the cover enter these recesses, the screws *g g* passing into them; nuts *h h* are then put upon these screws to force the cover down towards the middle block, compressing the packing *X X*, which may be of hemp or cotton. In order to prevent the steam from passing by the cover, plugs *i i* are screwed into the holes through which the nuts *h h* are introduced, and stuffing is put into the recess *j*, and pressed into tight contact with the piston rod by the ring of metal *k*. When the piston is packed and put together, there are spaces left of about three-fourths of an inch between the middle block and the bottom and cover, to allow each of them, when pressed upon by the steam, to approach towards the middle block, and to cause them, by their inclined planes, to force the packing outwards; thus the pressure of the steam against the bottom and cover, acts in the nature of an adjusting spring, to press the packing more or less forcibly into contact with the cylinder, according as the pressure at which the engine is working is greater or less. It is evident that the higher the pressure is of the steam, the more forcibly ought the packing to be pressed against the cylinder; this is effected in a very accurate manner by this piston, even in engines working expansively, in which the stroke of the piston begins with very high and ends with low pressure; for in the same ratio that the pressure of the steam on the piston is reduced, will the force with which the pack-

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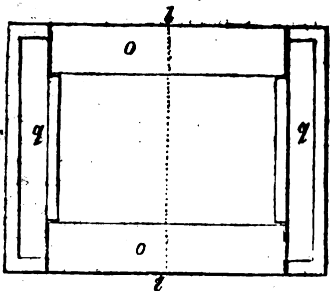
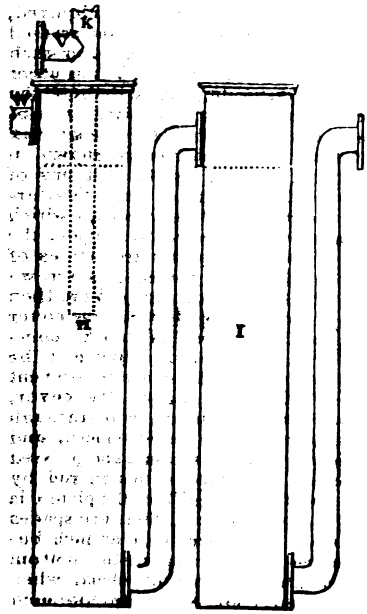
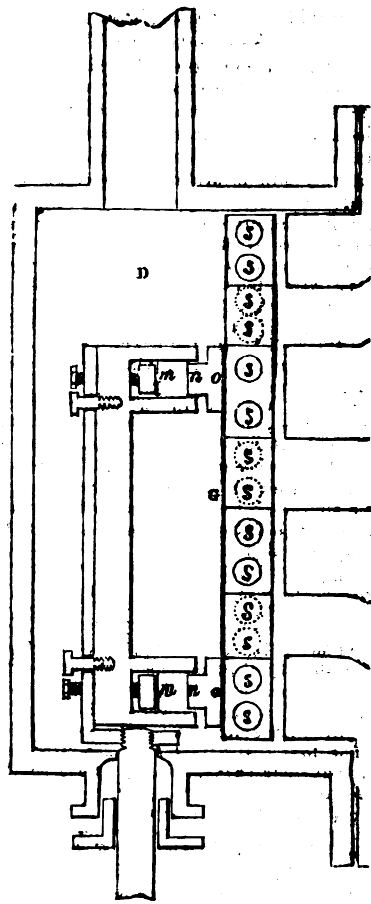
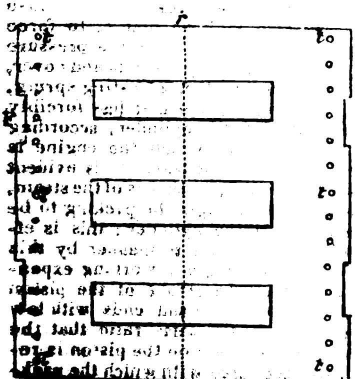
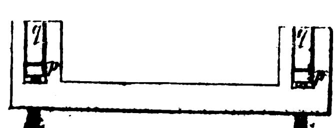








E



ing is pressed outwards, against the cylinder, be decreased."

Improved Steam Valves.

The improvement here introduced is an essential accompaniment to that of the piston. It has for its object, to prevent any loss of steam which might arise from the slides becoming untrue, through friction or unequal expansion. We have recourse again to Mr. Hall's own description:—

"My improvement upon valves is applicable to all those coming under the denomination of slide valves; the one I have delineated is the flat valve, that alternately connects the passages from the upper and lower end of the cylinder with the steam pipe and the eduction pipe. It consists of two parts, viz. the slide or sliding frame, and the seat plate on which it works. *C* shows the face of the sliding frame, *D* a section of it cut across in the situation of the dotted lines from *l* to *l*, and *E* is a transverse section. There are grooves formed in the ends and sides of the sliding frame; the side grooves must each have a flat metallic bar of the length and width thereof inserted at the bottom, the grooves must then be filled with packing, which may be made of strips of cotton or linen cloth; the grooves in the top and bottom of the frame must, in like manner, have metallic bars and strips of packing inserted into them the widths of the grooves, and of such lengths as to abut up to the bars and packing in the side grooves; the tops and bottoms are then to be faced with plates of steel, having ribs at their backs, which enter into the grooves to be pressed upon by the packing. *D* shows sections of the bars *m*, the packing *n*, and steel face plates *o*, of the top and bottom grooves, and *E* shows sections of the bars *p* and packing *q* of the side grooves. *F* is the seat plate, made of steel, on which the sliding frame works. *G* is a section of it as cut across in the situation of the dotted lines from *r* to *r*. This seat plate is perforated with channels *s*, so as to render it hollow, and they are pervaded by steam, by means of the holes *t t* (in the face of the plate) which enter into them. The intention of the sliding frame is to enable each end and side of it to adjust itself to the seat plate, independently of the others, as it is difficult to make slide valves of the common construction (owing to their large working surfaces) sufficiently accurate and steam tight, especially in high pressure engines, as they are warped and rendered uneven when heat is applied to them. The intention of the perforations of the seat plate is to cause it to be pervaded by the steam, whereby it is prevented from otherwise becoming untrue; packing of linen or cotton cloth is inserted between the seat plate and the nozle or block of the cylinder, to prevent the escape of steam."

Improved Mode of Lubrication.

More ingenuity and skill are probably displayed in this part of Mr. Hall's series of inventions, than in any other; but we doubt much whether to equal advantage. The mode of lubrication he proposes, is encompassed with practical difficulties, and at low temperatures does not offer any adequate compensation for the trouble attending it:—

"My improved method of lubrication consists in the injection of an uniform stream of oil by a force pump, or other means, into the pipe leading to the working cylinder, or into the cylinder itself, and in a method of separating such oil from the water on leaving the engine, to repeat the lubrication, *ad infinitum*. In condensing engines, my mode of lubrication cannot be practised without my method of condensation is adopted, whereby no water but the distilled water resulting from the condensation of the steam, enters the internal parts of the engine and mixes with the oil *H* and *I* are vessels which I call separators, to effect the separation of the oil and water. *K* is a perpendicular pipe, one end of it being open to the atmosphere, and the other entering into separator *H*, which is, as well as the other separator, filled with pure water up to the dotted lines. *V* is a branch from the perpendicular pipe which, in high pressure engines, is connected with the eduction pipe of the working cylinder, and in condensing engines with the exit valve of the air pump. The water, oil, &c., on leaving the engines, enter the perpendicular pipe in commixture with each other; such fluids as are gaseous escape through the upper end of the pipe into the atmosphere, and the water and oil descend through the lower end, whence (owing to their different specific gravities) the oil rises to the top of the separator, and the water descends to the bottom and passes to the second separator *I*, in which any little oil which may be carried away with the water, undergoes, a second time, the process of separation. More than two separators may be used, if required, to effect an accurate separation of the oil. *W* is a pipe at the top of the first separator, which is connected with the force pump, to return the oil to the engine as abovementioned, occasional additions only being supplied to replace any little waste that may take place in the course of working."

[The improved method of condensation in our next.]

CUBIC EQUATIONS—A GREAT DIFFICULTY (ALMOST) SOLVED.

Sir,—General rules are never derived but from a number of particular ones, and that only when the greatest analogy subsists between them, more especially in the mathematical sciences. Forcibly struck by the great difference between the methods for the solution of those equations we are able to solve as the science stands, that is, those of the 2nd, 3rd, and 4th degree; and considering this want of analogy as one of the principal causes of the little progress made in this branch of algebra, I sought to remove it as much as lay in my power, and have succeeded as to the cubic equations. The result I now communicate to you, in the hope that you will insert it in your most useful and excellent periodical.

Substitute in the equation $x^3+px^2+qx+r=o$. $x=y+a+\frac{b}{y}$, after which eliminate the denominator y^3 in the equation; thus tranformed, you will obtain the following result:—

$$\begin{array}{l|l|l|l|l|l}
y^6 + 3a & y^5 + 3a^2 & y^4 + 6ab & y^3 + 3a^2b & y^2 + 3ab^2 & y + b^3 = o. \\
\quad + p & \quad + 3b & \quad + 2pb & \quad + 3b^2 & \quad + pb^2 & \\
 & \quad + 2pa & \quad + r & \quad + 2pab & & \\
 & \quad + q & \quad + a^3 & \quad + qb & & \\
 & & \quad + pa^2 & & & \\
 & & \quad + qa & & &
\end{array}$$

in which, if you determine a and b by making the co-efficients of the 2nd and 3rd terms $=o$, the 2nd, 3rd, 5th, and 6th terms will disappear, and the equation will assume the form $y^6+My^3+N=o$, whence $y^3=-\frac{M}{2}+\sqrt{\frac{M^2}{4}-N}$; whence, also, you will obtain 3 answers for y, which being substituted in the expression $x=y+a+\frac{b}{y}$, together with the values of a and b, precedently obtained, will give the three roots of the original equation $x^3+px^2+qr+r=o$.

Not desiring to trespass on your patience, I have omitted a few details; but this omission will not prove any obstacle to the comprehension of the solution, to any person in the least acquainted with algebra.

I remain, Sir, your obedient servant,

C. ASHLEY.

[We thought, at first, that Mr. Ashley had really fallen on a discovery of very great originality and value; but, having requested a mathematical friend to push Mr. Ashley calculations to a final result (which, it appeared to us, Mr. Ashley had not done), we find, by our friend's report, that, after all, the value of x is just the same as that obtained by Cardan's rule. For, suppose the 2nd term of the equation were wanting, $Px^2=o$, or $P=o$; and since $3a+P=o$ $\therefore$ $a=o$; also by supposition, $3a^2.+3b+2Pa+q=o$ $\therefore$ $b=-\frac{q}{3}$. Mr. Ashley's 2nd equation assumes the form $y6+ry^3-\frac{q^3}{27}=o$; and solving this quadratic equation, we obtain $y=\left(\sqrt{\frac{r^2}{4}+\frac{q^3}{27}}-\frac{r}{2}\right)^{\frac{1}{3}}$; consequently, $x=\left(\sqrt{\frac{r^2}{4}+\frac{q^3}{27}}-\frac{r}{2}\right)^{\frac{1}{3}}+\frac{b}{\left(\sqrt{\frac{r^2}{4}+q^3}-\frac{r}{2}\right)^{\frac{1}{3}}}$; being the identical theorem obtained by Cardan's rule, which presents an impossible form when q is negative, and at the same time $\frac{q^3}{27}>\frac{r^2}{4}$.—ED. M. M.]

SHALDER'S FOUNTAIN PUMPS.

To the Editor of the Mechanics' Magazine.

Sir,—The accompanying paper, being less suitable for the "Gardener's Magazine" than for your work, I send it you, not doubting that Mr Mallet will approve of its destination, should you publish it.

I am, Sir, &c.

J. C. Loudon.

Bayswater, October 22, 1832.

Dear Sir,—As the subject of Shalder's Fountain Pumps seems to have excited some attention amongst gardeners and others, who are interested in raising a large quantity of water with little labour, and as you have praised it warmly in the "Gardener's Magazine," I think it useful to send you the following information about it, for those whom it may concern.

Some time since, a person, a very plausible one, called on us here, who stated that he was the proprietor of the patent for Shalder's Fountain Pump, and wished us to buy his patent right for Ireland; and, to shorten what might be a long tale, suffice it to say, that after much coming down in price on his part, and entreating that we would buy, we found, on consulting the records here, *that he had no patent for Ireland at all;* and that consequently we had had a narrow escape of what seemed a very ill-looking transaction, to call it by no worse name. We saw no more of the gentleman; but while in negociation with us, we found he had been also in treaty with a worthy Alderman of this city, who had actually bought the supposed patent right. So much for the way in which we became acquainted with Mr. Shalder's Fountain Pumps and their proprietor, which I have informed you of, in order that you may not suppose me influenced by any "sour grape" prejudice, in any opinions I may hereafter advance of those pumps, seeing that we, or any one else, are perfectly at liberty to make them at pleasure.

Before saying any thing upon the merits or demerits of these pumps, I would wish to consider a moment the patentee's claim to be the original inventor of them, and consequently the validity of his English patent.

In part of the preamble to the prospectus puff of the Fountain Pump, we are informed that the inventor "has been aided by a profound knowledge of the various writings of some of the most celebrated authors on hydraulics;" and I verily believe it, for if you refer to Belidor's Arch. Hydraulique, tom. 2, liv. 3, chap. 3, pp. 120, &c., you will find the pump of which he pretends to be the inventor, exactly described, and accompanied by a plate, as the invention of two Frenchmen, Messrs. Gosset and De la Deuille, *about one hundred years ago.*

The passage begins—"Messieurs Gosset et De la Deuille en travaillant à la composition d'une machine hydraulique extremement ingénieuse, et dont je donnerai la description parla suite ont imaginé un piston entierement exempt de frottement et qui peut s'employer, indépendamment de la machine, dont il est une partie essentiel, comme ils l'ont fait au Jardin du Roi à Paris, a une pompe qui éleve de l'eau pour arroser les plantes de même Jardin."

On reference to the whole passage, which is too long to transcribe, the pump will be seen to be identical with Shalder's; but for the satisfaction of those who cannot gain access to the book, one line will be enough, at the conclusion of the description. Belidor says, "ainsi le piston compose une espece de bourse."

So much for Mr. Shalder's profound knowledge of the French virtues on hydraulics: now for the English ones. In the 2nd vol. of "Gregory's Mechanics," a pump is described, upon which Nicholson, in his "Operative Mechanic," makes the following observations:—"Here is a pump divested of friction, and perfectly light," &c. &c. And further, "the experienced reader will see that this pump is very like that of Gosset and de la Deuille, described by *Belidor and most writers on Hydraulics.*" I cannot stop to give the details, but refer to the book itself, which is easily obtained.

A description is also given by Nicholson, of a pump invented by Benjamin Martin, which so exactly coincides in every respect with that of Mr. Shalder, that it would puzzle even him to point out any difference between them; and as we thus have three pumps, invented by as many different persons, each similar to that under consideration, it is for those learned in the law of patents to determine what may be the value of Mr. Shalder's.

In fact, this is an instance of what has

become common in London, especially of late years—the furbishing up an old invention, and taking out a patent for it, either through ignorance or a worse intention. A man named Downton, some time ago, procured a patent for working a pump with 3 pistons in one barrel, and at least three different persons are to be found having patents for the same thing in the Repertory of Arts, and, after all, the contrivance is to be found in several old books on hydraulics.

I wish to reserve to another opportunity all consideration of the mechanical advantages or disadvantages of these pumps, having in view an enlarged and accurate train of experiment on the subject; but, meanwhile, I cannot refrain from expressing my disgust at the bombastic nonsense of the prospectuses which have appeared of them. They disgrace the mechanical profession, and insult the common sense.

For instance, what is the meaning of the title, "Gravitating—Expressing—Fountain?" What gravitates? How does it express? Or how is it a fountain more than the common "scrape and go," as bored pumps are facetiously termed? So, indeed, the cylinder of a 100-horse engine is a "*scrape* and go," and an air-pump is a "*scrape* and go," and Mr. Shalder's pump is truly "a go."

Moreover, it is "considered the greatest improvement in the art of raising water that has appeared within the last two thousand years," *i.e.* by Mr. Shalder, I presume. So, it is a greater affair than Ctesibius's (the Athenian) discovery of the nature of a pump at all, or than Torricelli's discovery of the nature of a vacuum! Really, Mr. Shalder is very complimentary to these Messieurs Gosset and De la Deuille.

Then we have the motion of this truly wonderful pump likened, first, unto the "fishes in the sea;" then to "a sail on a mast;" and, finally, to the "lungs in the human frame." In fact, it is a perfect Proteus.

Then we have an hitherto altogether unrecognised principle in mechanics acquired—"*the whip principle*"—by which one man does the work of two. I presume this must be effected by applying the principle to the man's back.

Then its durability is considered proved, because that, "if the working parts be occasionally renewed," the pump will last for 100 years; or, in other words, if the parts be replaced as they are worn out, the pump will last until it becomes a new pump, "lock, stock, and barrel," as the saying is; in which respect, its superiority is obvious over every other pump.

Then its importance is shown, because if only *one* line-of-battle ship should be saved in a year by it, £200,000 would be saved to the nation. Ah! very true, very true; but then the *if*. Pray, how many line-of-battle ships are lost per annum through failure of the pumps.

Thus the two prospectuses proceed much in the quackery style of the dealers in animal magnetism.

But it would be worthless to pursue such nauseous stuff further; in truth, it is below criticism. And yet by these and such productions is the public led.

It will be observed, that I have confined myself exclusively to showing that Mr. Shalder is not the inventor of those pumps, and commenting on his prospectuses. At a future opportunity, I hope to be able to lay before the public a detail of such experiments as shall place the merits of the pump in their proper aspect.

I am, Sir, &c.
ROBERT MALLET.

94, Capel street,
15th October, 1832.

ERICSSON'S STEAM-ENGINE AND WATER-WHEEL.

Sir,—I find that last week's Number produced another specimen of Mr. Busby's imperfect notion of Mr. Ericsson's engine. He asserts, that there is a "great" leak caused through the slits of the oblique plane, on account of the change of the relative position to the wing. My last communication proves that the wing always fills the slit, being made hollow; therefore the represented leak does not at all exist: but even were the wings not hollow, Mr. Busby's notion of the leak will be equally erroneous, for the wing being $\frac{5}{8}$ inch thick, and the proportion between the plane and cone $=$ 325 to 307, the "varying width of the slit" will be only $\frac{36}{1000}$ parts of an inch (307 : 18=0,625 : 0,036); but this takes place *only* when the wing is in a *vertical position*, and diminishes very rapidly as that position changes, and very nearly in

the same proportion as the ordinates to a logarithmic curve, the axis of which is equal to one quarter of the circumference of the plane. Now, the mean of these ordinates will be less than $\frac{1}{4}$ of $\frac{36}{1000}$ parts, hence less than $\frac{1}{100}$ part of an inch, or about equal to $\frac{1}{600}$ part of the average width of the wing, and which will, supposing the pressure of a 30 feet column, cause a loss under $\frac{1}{200}$ part of the water used; and this leak it is that Mr. Busby puts forth as a proof in support of his fallacious demonstration of the useless comparison with the "unpacked piston," and which he rather condescendingly admits not to be an "insurmountable obstacle."

If it never struck the inventor to attach an air-vessel—this old appendage to hydraulic engines—he must feel indebted to Mr. Busby for so important a suggestion.

I am assured by Mr. Busby, that he has no desire to undervalue the ingenuity of Mr. Ericsson's engine. I beg to assure him that I have not undertaken the task of advocating that unimportant point; but I cannot forego to say that Mr. Busby's concluding remark is very inconsistent: he forgets that the circumstances which he has "pointed out" have not been substantiated by even an attempt at proof, but, on the contrary, proved imaginary.

I am, Sir,
Your most obedient servant,
MECHANICUS.

London, October 26, 1832.

P. S.—In my last communication, art. 5, lines 31 and 32, for "preceding" read "following;" in line 33, read "solely," not "safely;" and at the conclusion of the same article, for "check all the momentum required during the preceding revolution," read "check all the momentum *acquired*," &c.

Sir,—It is not my intention to engage in an interminable discussion with "Mechanicus," who, I cannot help suspecting, from the peculiar tenour of his communications, to be more than ordinarily interested in the success of Mr. Ericsson's new engine, with all the *secrets* of which he seems to be so well acquainted. I would, therefore, merely observe, that your correspondent now gives us (as on a former occasion) some further particulars of the sectional form of the wings, *not* set forth in the description originally given in the Mechanics' Magazine, and assumes that he has refuted my positions, when, in fact, he has admitted or confirmed them all.

Mr. Murdoch informed us, some weeks back, that Messrs. Maudsley and Field were engaged in constructing an engine on Mr. Ericsson's new plan. The work cannot be in more experienced or more skilful hands; and I think we shall do well to wait the result of their experiments.

I am, Sir,
Your very obedient servant,
C. A. BUSBY.

Stanhope-Place, Brunswick-Terrace,
Brighton,
October 27, 1832.

COMETARY CALCULATIONS.

Sir,—You are very severe (p. 64) on your Penny contemporaries of the Useful Knowledge and Christian Knowledge Societies, as also on Mr. Pinnock, for furnishing the public with such discordant statements respecting the comet; but in the letter of Mr. Herapath to *The Times*, from which you have given one very sensible extract (p. 63), he shows that there have been still greater differences on the subject, even among men of the very highest astronomical authority. You will perhaps not refuse a place to the passage to which I allude:—

"A question might here very fairly be put, namely, can we depend on these calculations? And might they not be so much out, from causes which could not be measured or comprehended, as to allow of our being in the situation so much to be dreaded? In reply, it may be said, that the body has already appeared, and very nearly in the place assigned to it. This, however, it must be acknowledged, is no guarantee as to the agreement during the rest of its course. It may accord very nearly at its first appearance, and still differ widely as time advances. In proof of this, I have only to refer to its places calculated by M. Damoiseau, in the Connaissance for 1830, and Mr. Henderson, our Astronomer Royal at the Cape, in the Supplement to the Nautical Almanac for 1832, both men of unimpeachable care and ability, and both professedly computing from the same elements. M. Damoiseau places the comet for August 5, about noon in 35° 46′ R. A., and 28° 44′ N. Dec.; and Mr. Henderson at nearly the same period, in 36° 15′ R. A., and 28° 56′ N. Dec., dif-

fering but little. But Nov. 2, at about 6 2-3d hours A. M., Damoiseau's plan is 112° 1′ R. A., with 20° 37′ N. Dec.; while Henderson's, Nov. 2, at noon, is about 150° 45′ R. A., with 10° 2′ N. Dec.; that is near 39° different in R. A., and 10½° in declination. This happens not long after the comet has passed the plane of the earth's orbit. Again, Nov. 28, at the same time in the morning, the French comet is in 124 R. A., and 8¾° N. Dec.; and the English, at noon, upwards of 182 R. A., and 13° S. Dec.; that is, the two places disagree in R. A. nearly 59°, and in Dec. nearly 22°; the one placing the comet 9° above the equator, and the other 13° beneath. Nothing can more clearly demonstrate the difficulties and uncertainty of these calculations, than such discordances."

Ought not such facts as these, to dictate an indulgent consideration of the errors of lesser men?

I am Sir, your obedient Servant,

H. N.

[By way of answer to the question with which our Correspondent concludes, we beg to put another—Does any man suppose for an instant, that the "lesser men" alluded to, founded their erroneous statements on any calculations of *their own?* "Guide" Pinnock for example!!! For a man who can and does calculate, to err is excusable—the more so, the more he shows himself in earnest; but for one who is incapable of any thing of the kind, to err on purpose, for the sake of being thought to know something of the matter, is absolute imposture. We have had but too much of this, in more than one branch of experimental science.—Ed. M. M.]

IMPROVEMENTS IN THE SCREW.

Sir,—The communication of P. M., p. 377, last vol., betrays want of consideration, more perhaps than any want of knowledge of the construction, the action, and the power of the screw. In the first place, it is impossible to make a nut fit with even a tolerable degree of accuracy on a conical screw, every thread of which makes a different angle with its axis. 2dly. The action being in a great measure dependant on the accuracy of construction, it follows of course that when the rake of the first and last threads differ a quarter of an inch, (as in the one he has described) a screw and nut with an angular thread must soon destroy each other, while with a square thread the action would be still worse.—3rdly. Much of the power depending on the former circumstances, must of necessity be lost by the immense friction occasioned by the threads of the nut and screw crossing each other.

Yours respectfully,

Trebor Valentine.

Derby, Oct. 27, 1832.

A FEW WORDS IN BEHALF OF THE STEAM CARRIAGE EXPERIMENTERS.

Sir,—I have had a long acquaintance with your very useful and entertaining publication, but have been sorry always to perceive what appeared to me to be a strong under-current of prejudice against the probability of steam carriages running successfully on common roads. Why this should be the case I am at a loss to imagine, since such an invention, independent of its usefulness, if successful, is so extremely interesting, that to watch the progress of it has been not only agreeable to most people, but I have seldom been in company, of late, without hearing the subject introduced; and, in general, have found those prejudices, which you still seem to cherish, gradually passing away.

Some time since I saw one of those carriages pass me on the road, and I must confess that its performance struck me with admiration. I presently saw it stop to take in water. I stepped on, and took a hasty view of it. 'Unsightly enough,' said I, 'although it goes so well.' So said some others; but taunts and jeers were in general the order of the day, and these, loud, boisterous, and insulting. The proprietor, who was busily occupied in looking to his machine, scarcely noticed this; but presently a stentorian voice exclaimed, 'He that invented and can manage such a machine as this, can well afford to bear the scoffs of such an ignorant and stupid rabble.'

Now really, Mr. Editor, although I do not mean any thing offensive, still, the "Note Worth Notice" on steam locomotion, at p. 42, brought this clever speech fresh to my mind. In a miscellany, professedly devoted to mechanics, would it not seem more fitting to reject mere squibs and jeers on a subject of so much importance, and to collect, and

insert instead thereof, all the facts and circumstances attending the various experiments that are constantly being made with these machines? I may be mistaken; but it appears to me, that solid and correct information on these matters, would be forwarding the true objects for which this Journal is established.

Newspapers as might be expected, get imposed upon by statements, both for and against, according to the fancy or caprice of the writers, and which, in such fugitive publications, may well be excused;—but we want, if possible, to obtain the naked facts, that we may judge for ourselves. It is of little use to consult grave authors, even with the apendage of a Dr, upon practical matters, as you have yourself so lately, with so much truth and justice, shewn. Mere book-manufacturers, in short, will not do for us. Where, then, shall we mechanics turn so naturally, and with so much confidence, as to our own Magazine? Surely, Mr. Editor, you can have no wish to disappoint us; and there can scarcely be a place in this kingdom where such experiments are made, but there are also readers of this work who would become contributors were you to ask for it, or even to suggest the usefulness of such communications.

For my own part, I am a sincere well-wisher to the advance of science generally, and to the success of steam carriages in particular, come whence they may; as, upon mature reflection, I believe they are destined to afford to mankind a lasting benefit. Nor am I altogether an idle spectator, but rather an interested one; for (to continue my narrative) after witnessing another trip with this carriage, I asked the proprietor to allow me a seat, with which he politely complied, and off we went at ten miles an hour: this was increased to full fourteen. The guiding did not appear to be difficult, nor was there any thing unpleasant in regard to smoke or noise. From that moment I have had the full conviction that nothing can prevent the adoption of this mode of conveyance, at no distant period, on all the turnpike roads in the kingdom. A prospectus was given me, and I immediately subscribed for two shares in a carriage just now completing. If but a few of the "general astonishment" folks were generously to contribute to the expense, instead of their jeers, would it not be a more rational and manly course? "The slow movement" is very much to be regretted; but those that express astonishment at it, little know, perhaps, the expense of such undertakings; and although immense sums are stated to have been contributed to the encouragement and support of Mr. Gurney, and Messrs. Ogle and Summers, yet, in the present instance, the case has been very different. Public patronage was not sought for until more than three years had been spent upon preliminary experiments, nor until success was secured, and even then it was with difficulty that a sufficient number of subscribers could be found to furnish funds for the carriage.

Such are the facts, as stated to me, and I believe correctly. The "general astonishment" should rather be at the general apathy, and in a few short years the "general astonishment" will be on the other side,—that the consummation of such an achievement should, in this enlightened age, have flagged for want of due encouragement and support. I have had several trips on "The Infant" since, and with increased satisfaction. Indeed, its ingenious inventor proclaims this vehicle always ready for action, and always (at a day's notice) at the service of that portion of the public who may be disposed to make use of his carriages. This is an ingenious mode of proceeding, affording facilities for inspection and trial sufficient to satisfy every candid mind.

To attempt to run a *single* carriage regularly for hire would be, I think, such an absurdity as no man in his senses would entertain—at least, with a view to a profitable return; as all the expense of stations, &c., would be the same as for a number. Besides, in the event of the least thing occurring to take it off the road for a day or two, there are those who would be gasping for a chance to raise afresh the ancient note, "Oh, it will never answer—nonsense—I don't like these new inventions!" No, no, let us have two or three carriages, at least, to start with, and then these potent engines will not more easily roll down the rugged roughness of our public roads, and thereby daily more and more facilitate their own onward motion, than success and triumph will roll down and stifle the old road-side note of "It never can do;" but the strong prejudices also of the more

respectable and better informed. But I have already far exceeded my intentions, and perhaps the bounds of your patience.

ANIMO.

[We insert with great pleasure this very civil and temperate remonstrance. We candidly confess, that, for various reasons which appear to ourselves of great weight, we do not expect to see steam power ever applied *with economy* to *quick* travelling on *common roads;* and we must own, too, that we have not been always able to view, with the desirable degree of gravity, the extravagant pretensions of some of those who have undertaken to convince the world of the contrary. It is unjust in our correspondent, however, to impute to us that we have passed over unheeded the experiments which are in progress. We have had an eye to them all, and think we may refer with confidence to our pages for a record of every thing of real importance which has transpired. If we have not inserted every thing that has reached us on the subject, or has been going the round of the other journals, it has been because, like our correspondent, we wish for "naked facts" only, and hate mere moonshine.—ED. M. M.]

MR. HANCOCK'S STEAM CARRIAGE.

Sir,—Among the Notes Worth Notice (p. 42), is an article on steam carriages, which, I conceive, invites reply. It commences, "The tardy progress made in bringing steam carriages into use, continues to excite general astonishment;" and goes on to state, that Mr. Gurney had professed, long ago, to have overcome every difficulty, though he has now retired from the field; that Messrs. Ogle and Summers declare they have also brought their carriage to perfection; and that Mr. Walter Hancock is so confident of success, that he wishes to set on foot a company, to monopolise all the intercourse between the City and Paddington, although, for some unexplained reasons, he has taken his steam carriage, called the Infant (which did run for some time to Stratford), off the road." I am only acquainted with the carriages of Mr. Gurney, and Messrs. Ogle and Summers, by report, and by reading statements respecting them in your own and other scientific periodicals. With respect to Mr. Walter Hancock's operations, I can give opinions and make statements with greater confidence.

Mr. Hancock run "the Infant" with such success, for some time, between Stratford and London, as to convince the most sceptical that he had overcome those difficulties which had hitherto attended steam carriages; and the result of this was, the formation of two companies, one of which is for the Paddington district. Having given perfect satisfaction to all the scientific gentlemen who had travelled by the Infant, he considered it no longer necessary to run it, excepting when required for any particular party who had not witnessed its performance; and that it would be far more to his advantage, as well as to that of the shareholders in each company, to devote his time to superintending the construction of the carriages ordered, and now in progress to completion. When I speak of giving satisfaction, I do not include the generality of coach-masters, and others interested in horse travelling; these do not wish to be convinced of the practicability and advantages of steam conveyance.

There is a very mistaken notion entertained with respect to the construction of steam carriages. They are not to be got up with the facility, and in the same time, that four-horse coaches can be built, which have had the benefit of successive improvements, and continued manufacture for generations. A steam carriage is a novelty—a mechanical work new in principle, all the bearings of which are not yet fully developed.

Although foreign to the matter of reply which I set out upon, I cannot help offering a few remarks on what has been said on the subject of steam carriages by Dr. Lardner, in his last edition of "Lectures on the Steam Engine." Having always respected the Doctor as an author, I regret that either ignorance of the subject, or a favourable feeling to Mr. Gurney, should have produced such a garbled and unfair account of Mr. Hancock's inventions.

I would not complain of Dr. L.'s devoting twenty-eight pages to the praise of Mr. Gurney's mode of generating steam and constructing his carriage, whilst he allows but four pages to explain Mr. Hancock's plans, had he but *fairly* explained them. Mr. Hancock has been long engaged upon steam carriages, although not quite so long as Mr. Gurney; and as to pecuniary matters, he has had no one's purse but his own at command.

Notwithstanding this, he has, by the unremitting exercise of his abilities, invented a boiler, and applied machinery, differing widely in principle and construction from those of any one else, and which have obtained for him the approbation of every disinterested scientific person that has seen his carriage at work, and examined his perfect means of performance.

Dr. Lardner repeatedly quotes the Report of the Select Committee of the House of Commons on steam carriages, and admits Mr. Farey's authority to be entitled to the highest respect.

Now, in that Report, we find Mr. Farey speaking of Mr. Hancock's carriage in the following terms, page 41:—"I consider Mr. Hancock's boiler to be much better for steam coaches than any other that has been proposed or tried. The flat chambers in Mr. Hancock's boiler are very judiciously combined, and are secured against bursting by causing the pressure, which tends to burst each one open, to be counteracted by the corresponding pressure of the neighbouring chamber; and the outside chambers are secured by six bolts of prodigious strength, which pass through all the chambers, and unite them all together so firmly, that I see no probability of any accident occurring."

Here is an opinion seriously given before a Committee of the House of Commons, by a gentleman whose talents Dr. L. respects, and directly at variance with the Doctor's praise of Mr. Gurney's boiler; and yet he has taken no notice of it whatever. One ground of Dr. L.'s preference is, that Mr. Gurney's boiler has a separator, while, according to him, Mr. Hancock's has none. Now he might have acquainted himself, that every chamber, in the latter, is a separator in itself, and that by no means would Mr H. use a general separator, believing it to be dangerous, and quite opposed to sound principles. It is curious enough, that in another page, when the Doctor is pointing out the defects (as he conceives them) of Mr. Hancock's boiler, he says "in the upper part of the spaces marked E, fig. 66, *steam only is contained;*" thus describing a series of separators, without its occuring to him that they are such. Besides, the Doctor should have known that the separator is a long standing invention of Mr. Woolf, and not "a contrivance (of Mr. Gurney's) of great mechanical felicity."

As to what the Doctor terms the "cardinal excellence" of Mr. Gurney's boiler, namely, its having tubular fire bars, let me inform him, that Mr. Hancock has used them in some of his boilers, so as to surround his fire-place completely with water, in its passage to the chambers to be vaporized. Again he says, that every part of Mr. Gurney's boiler is cylindrical, "a form which, mechanically considered, is most favourable to strength." I consider this to be a "*cardinal*" blunder; for the pressure is inside the cylinder, not outside, pressing the arch inwards. Now I have always seen the convex side of an arch weighted, not the concave.

"The draft," says Dr. L., "is maintained in this engine (Mr. Hancock's) by means of a revolving fan, worked by the engine. This, perhaps, is one of the greatest defects, as compared with other locomotives. The quantity of power requisite to work the bellows, and of which the engine is robbed, is very great, so great as to amount to, perhaps, more than half the whole working power of the machine."

Half the whole working power of the machine!! Why, half the whole working power of the machine would blow fire, fire-bars, and fire-place all away together, and leave the chambers suspended to generate steam of themselves.

But Mr. Gurney's method of getting a draft is, it seems, to pass the waste steam into a blowing box, and thence up the chimneys. Now we all know, that, as soon as the steam has performed its office in the cylinder, it cannot make its exit too rapidly to let the working steam, on the other side of the piston, have full effect. Mr. Gurney's plan, on the contrary, is to *retard* the ready escape of the steam; and thereby, as I apprehend, to lower the effective power as much as a revolving fan, like Mr. Hancock's. I may observe, in conclusion, that Mr. H. used this plan of passing the steam up the chimnies previous to adopting the fan, but abandoned it because it was a nuisance on the road.

I am, Sir,
Your obedient servant,
WILLIAM VERE.

Stratford, Essex,
25th October, 1832

ESTIMATES FOR PUBLIC WORKS.

Sir,—A record of facts, connected with science, is at all times valuable; and under this impression, I request your in-

sertion of the following statement, which will show the low ebb to which men of science are likely to be brought at the present economising period.

The Committee, appointed to superintend Blackfriars' Bridge, wrote to several scientific men, begging to know the terms upon which they would undertake to survey the whole structure, from the foundations to the very uppermost course of stone, and to make a report upon the repairs required, accompanied by the necessary drawings, specification, and estimate. If, Sir, public business is to be done in this manner, it cannot be *well* done. How is an engineer to know how much time will be occupied by the parts under water? How is he able to calculate for what period he may require the diving bell, the expense of which, and the necessary attendance of barge and watermen, are to be paid for by him? How can he, by anticipation, foresee how long the specification may be,—how numerous the drawings? To estimate these contingencies, he must be lynx-eyed indeed. If the Committee had engaged a professional man, equally well known for his integrity and his abilities, it had been prudent, perhaps, to make an engagement with him for so much a day; but it is preposterous to suppose that an engineer should be able (with even an approximation to the truth) to calculate, within a hundred or two, what would be a fair remuneration for his trouble and expenses. Such public bodies may be assured, that a hungry competitor for public notice will make his report in so vague a manner, draw up his estimate so loosely, and furnish such meagre drawings, as to render it necessary for the Committee to employ him in seeing the works executed, and then he will have them under his thumb; for, if they do not continue his engagement, they must re commence their advertisement for new tenders for surveys.

It is to be regretted, that so little "*esprit du corps*" exists among the engineers and architects, and that the parties applied to did not reject with scorn a proposition so degrading to men of confirmed reputation and acknowledged skill. Mr. Walker, the cheapest tenderer, has no enviable job.

I am, Sir,

Your obedient servant,

AN ARCHITECT AND ENGINEER.

SAFETY-VALVES.

Sir,—I beg leave to call your attention to a difference between the phenomena I described, p. 26, and what you have inadvertently called a similar observation, communicated to the Franklin Institute, by a Mr. Halderman. Mr. H. says, he knows it to be a fact from experience, that water will rise up in a boiler when the safety-valve is opened; and this he ascribes to its being suddenly relieved from the pressure on its surface: but the fact, as it fell under my notice, was, that the float, and consequently the surface of the water, lowered on opening the safety-valve, and did not rise again until the valve was closed, or the pressure wholly removed. By way of varying the experiment, I have since watched for the rising of the valve, by the force of the steam only, when I found its blowing off in the way occasioned no movements whatever in the float, but on starting the engine it lowered one inch and three-quarters, and, although the engine continued at work, it very soon rose again to its former height.

I remain, Sir, yours respectfully,

TREBOR VALENTINE.

Derby, Oct. 27, 1832.

REMARKS ON THE EMPLOYMENT OF CHALK OR LIME ON ROADS AND IN AGRICULTURE.

Sir,—Whoever has observed the excellent state of all roads which traverse chalky lands will readily be convinced of the great improvement which would be accomplished by covering roads universally with chalk. The road thus formed appears to be even more durable than that prepared with silicious substances (broken stone) as now practised, and requires, perhaps, not a tenth part of the labour. It is not improbable, however, that the two together, chalk and stone, would form a compound of greater durability than either employed separately, for we know that such substances beat together, and exposed to the influence of air and moisture will form into a mass of stony hardness.* I do not know whether

* It is possible that greater perfection might be given it by the admixture of other earths, as clay, puzzolona, and volcanic products especially, which, in Italy, are found not only to have resisted the action of the elements for thousands of years, but to have formed a mass approaching in hardness almost to that of granite.

other forms of combinations of lime, as gypsum, selinite, &c., would be equally useful; it could be determined by experiment only: this, however, is of less moment here, as chalk is the most abundant. On the east coast of Demerara the road has for many years been formed with sea shells*; and this substance, when trod into the road, is found to produce a strong kind of cement, which proves exceedingly durable, notwithstanding the abundance of rain which at times falls, as it were, in torrents.

It is not necessary, however, to go so far abroad to witness the advantages of combination of lime for this purpo e. The best road I have ever seen, in England or elsewhere, was not a macadamized one, owing nothing whatever to art, but running over chalk beds, in the west of England. I would notice particularly that of the Downs, near Bridgewater, or on the Bath road; it is worth a journey from London to see it, by any one interested in such improvements. It would be desirable to ascertain the composition of the ground by careful analysis. But there are several parts of Somersetshire, and other parts in the west of England, I believe, which present the same proofs of the superiority of chalk over every other substance for roads. An instance is, I understand, afforded nearer London, in Bedfordshire, at or about the chalk hills, the north-eastern extremity of the London Basin.

Whilst on this subject, I would observe, that the use of calcareous earth seems to be too little appreciated by the farmers on cold, damp, or clay grounds. I would merely remind them of this matter, which has, I think, been pointed out by Sir John Sinclair and Sir Humphrey Davy, two of the greatest benefactors of the present age. The plaster of Paris (gypsum, or sulphate of lime,) has been found to be a vast improvement to many soils; but, from some experiments in the garden, I have reason to consider it little, if at all, superior to the more abundant carbonate of lime, or chalk. It should be borne in mind, that the three grand improvers of soils, generally, are *lime*, *manure*, and *irrigation*.

By inserting these brief remarks in your Magazine, which traverses all parts of the globe, it may incite the attention of more judicious and *practical* men to an important subject.

I have the honour to be, Sir,
Your most obedient servant,
J. HANCOCK.

London, Sept. 1832.

* Probably phosphate and sulphate of lime.

MAIL-COACH ROAD COTTAGES AND GARDENS.

Sir,—Our plan for providing the road-labourers throughout the United Kingdom with *comfortable* cottages and gardens (Nos. 448, 455,) has been submitted to the Duke of Richmond, the Postmaster-General. His Grace has favourably received it.

To permanently provide that 1,000 poor families, who are entitled by *law* to poor-rates, shall live rent-free—to protect, and light, and ornament every 2,000 miles of the most public roads, by an expenditure of *only* £100,000—is a much more impartial, extended, and national plan of political economy than "the Dutch Poor Colony plan" can, under any circumstances, ever produce.

We propose no distinction between English, Irish, or Scotch. It is one measure of poor-laws for the labourers of the three countries.

Of course, an Act of Parliament would be required. Land, either to the right or left of the road, might be purchased or rented. As the subject is popular, and as the cottages would be both protectional and ornamental to the lands of the rich, it may be supposed that several gratuitous grants of land would be made.

To commence this really national plan, £100,000 will be necessary. This sum, it is probable, has either been, or will presently be received, by Lord Goderich, for the sale of colonial lands.

As to the colonies: by erecting 1,000 cottages for the reception of so many discharged soldiers and their families, a country would be colonised to the extent of 2,000 miles. This is the credit side of the account; for it really cannot be considered either good feeling, or good sense, that the soldiers should return from New South Wales, the Cape of Good Hope, the Canadas, &c., to be first discharged, and then invited to return at the public expense.

I am no architect. Mr. Loudon, "Caballais," and your other architectural correspondents who approve of the plan,

will, I hope, submit their models for mail-road cottages and gardens to his Grace the Postmaster-General.

I am, Sir,

Your very obedient servant,

T.

October 29.

P. S.—Considering the jealousy with which the agricultural labourers regard machinery, this question can nowhere be more ethically supported than in the Mechanics' Magazine. The union cannot be dissolved, as the cottages cannot be erected but by mechanics. The generous *principle* of providing the labourers with improved dwellings originated in this Journal, with your talented correspondent, Junius Redivivus.

ANSWERS TO INQUIRIES.

MERIDIAN OF LONGITUDE.—Sir,—By a notice in the last Number of the Mechanics' Magazine, I perceive that a Correspondent wishes to be informed, "What is the true meridian?" There can be, I imagine, no doubt on this head. Nature has pointed out that the meridian line should be drawn round the globe, through the points where the ecliptic cuts the equator. To reckon the longitude from a mere arbitrary meridian, such as Greenwich or Paris, seems at least to be simply a gratuitous absurdity. What can be more ridiculous than to divide the earth into two hemispheres,—to call them eastern and western,—and yet to give twenty degrees of *east* longitude to the *western* hemisphere, and *vice versâ*, as is the case in English maps? By what rule do geographers divide the earth into hemispheres? By the very same rule which points out the line of division as the real meridian. Most of the continental nations, I believe, adopt the meridian of the Isle of Ferro, which is the one introduced by the Spaniards, and is by far the best of any in use, as it is nearly, if not quite, coincident with the real meridian. The French geographers generally use it in their maps of the world, but in their more particular ones, revert to the local meridian of their own country—that of Paris. It is to be hoped, that neither French nor English will longer persist in the custom they have so long and so unaccountably followed, but save an endless confusion by agreeing to measure our globe from the one and only line which the laws of our system dictate.—And I am Sir, your's obediently, F. H.

[Ferro was certainly for a long time adopted as the common point of departure; but, on examining a portfolio of foreign maps, published within the last twenty years—French, Spanish, Dutch, Portuguese, Russian, Danish, Swedish, &c.—we find that in every one of them a different place is chosen for the meridian, and that place either the capital or some principal sea-port of the country in which the map was published. Of F. H.'s reasons for the existence of a real meridian we shall merely say, that although we submit them to our readers, we are not at all convinced by them.—ED. M. M.]

ADULTERATION OF SNUFF. — The substances with which snuff is most commonly adulterated are very *considerately* pointed out to intending tricksters, in the statute by which such adulterations are prohibited under certain heavy penalties. The 5th Geo. I, cap. 2. enacts, that "every person who shall make, mix, or colour, or cause, &c. any snuff with *ochre, umber*, or other colouring, except water tinged with Venetian red only, or shall mix with snuff any *fustic*, or *yellow ebony*, *touchwood* or other wood, or any *dirt, sand*, or small tobacco sifted from tobacco, shall forfeit," &c. We advise "A Snuff Retailer," to consult on the subject, Mr. Jennings's very instructive "Practical Treatise" on tobacco, from which we extract for general information, the following simple test for the genuineness of snuffs:—Pour into a wine glass some very clear spring water, and then gently put upon it a small quantity of snuff. If the glass be not disturbed, the gross and heavy parts of the snuff, whether coarse or fine, will fall to the bottom very quickly; whereas that which has been manufactured from the fine parts of the tobacco leaves will fall down very slowly, and will often stand for a considerable time on the surface of the water.

SLAVE-GROWN SUGAR.—When "An Impartial Observer" (a party hireling, we will be sworn,) can point out to us any thing in the Mechanics' Magazine, which justifies him in supposing that we would entertain a discussion on the comparative value of free and slave labour, we shall be content to throw all we have ever penned into the fire, and our old grey-goose quill into the bargain. Were slave labour even ten times more productive than free labour, what of that? Would it give one man a right to take possession of his brother, and compel him to work against his will for the benefit of his oppressor? The system is altogether diabolical, and no nation ought to expect to thrive that sanctions or encourages it, under any pretext whatever. It is true, that the system has Mr. Hume for its apologist—"pity 'tis, 'tis true." The 'Rights of Industry' (we mean the *real* rights, and not what goes by that name in Lincoln's Inn Fields and Pall Mall East,) have never had a more steadfast and efficient advocate in Parliament than the Member for Middlesex; and very, very deeply is it to be regretted that he should have furnished the enemies of his general system of conduct with such a *back-lash* (mechanically speaking) as this. Funds for a "Manchester Mechanics' Hall of Science" are now in the progress of collection, "under the immediate patronage of Joseph Hume, Esq., M. P;" but only think of the consistency of a MECHANICS' Hall of Science being set on foot under the immediate patronage of an apologist of a system which allows a certain class of mechanics or labourers, in return for incessant toil, scarce subsistence enough to keep life and body together for half the ordinary term of human life, merely because they happen to have black skins, and are not, like others, white without and black within! All this notwithstanding, Mr. Hume should have *our* vote for Middlesex, and shame be to him who, for a difference on one point, would quarrel with the friend who agrees with him upon every other. We would say of Mr. Hume as Mr. Clay, the American, said to a constituent who objected to a particular vote he had given in Congress—"Because your good old rifle has missed fire for once, would you throw it aside, and trust to one you had never tried at all?"

ISINGLASS.—"A Hebridian" will find there is nothing new in his discovery that good isinglass can be extracted from ling. The Russians, who are the principal manufacturers of this article for the European markets, make it chiefly from the swimming-bladder of the sturgeon; but almost every species of fish furnishes it in more or less abundance.

PATENT LAW.—We do not think that the patent to which "A Foreman" alludes is worth any thing, being, as it is, for the application of a substance as old as the hills to a purpose as old, at least, as the first heap of rubbish.

MISCELLANEOUS.

Safety Tombs.—A new description of tomb has been recently introduced here by the Rev. Mr. Scholefield. It is a square structure of stone or brick, with a pyramidal top, enclosed within iron railings. A large bell is fixed and connected with a spring, so that if any one approach within a certain distance, it will ring for a length of time, and thus give an alarm to the neighbourhood, as well as notice of danger to any person who may have the temerity to attempt an entrance after the vault is secured. Corpses are frequently put into the vault for a certain time for security, and afterwards removed into their own graves.—A. W., Manchester, Sept. 27.

Cottagers' Prizes at the Annual Exhibition of the Royal Horticultural Society of Cornwall, Oct. 11, 1832.—The productions in this class were all, more or less, deserving of great commendation. The good effects of the Society are already beginning to appear in the excitement it has given to the industrious cottager. We doubt not but the rewards which have this year been distributed, will induce a larger portion to enter and compete for the prizes that will be given next season. Indeed, we think it is not too much to hope that in the course of a few years a great improvement will be visible, both in the exterior appearance and interior arrangements of our numerous cottages.

"The grassy lane, the wood-surrounded field,
The rude stone fence with fragrant wall-flowers gay,
The clay-built cot, to me more pleasures yield,
Than all the pomp imperial domes display."

As a distinguished writer ingeniously remarks, that the face is the index of the mind, so we are of opinion that the neatness and cleanness of the cottager's garden is the proof of the happiness and comfort within.—*Cornwall Gazette.*

Gold Sheathing for Ships.—The celebrated chemist, Proust, having ascertained that all salt contains a portion of mercury, thought it not unlikely that if a ship's bottom were covered with gold leaf, it might return, after a long voyage, with as much quicksilver adhering to it as would not only pay all expenses, but afford a large profit. The experiment seems deserving of trial, on a small scale at least.

Birmingham Railway.—We are glad to learn from "A Subscriber" to this railway, that one of the principal opponents to this Bill in the House of Lords has come round in its favour.

Grand Junction Railway.—The sudden dissolution of Parliament last year arrested the proceedings of two different Companies, which had been formed for the purpose of effecting a railway communication between Liverpool and Birmingham. The undertaking has since been revived, under the title of the "Grand Junction Railway," and the two rival Companies have united their forces to carry it into effect. It is now proposed that the railway shall proceed from Birmingham, by way of Dudley, Tipton, and Wolverhampton, to the north of Staffordshire (whence branches will eventually be made into the Potteries), and thence to Preston Brook, at four miles from which place it will be carried across a narrow part of the Mersey at Warrington, and join the Liverpool and Manchester Railway about midway between its two extremities. By thus including some fifteen or sixteen miles of railway already formed, the line will not only be executed at considerably less cost, but it will effect a communication with Manchester, as near and as direct as that with Liverpool. The engineers are Mr. Stephenson and Mr. Rastrick; and the Committee includes most of the gentlemen who took an active part in the formation of the Liverpool and Manchester line.

Harcourt's Oil-Gas Lamp.—In our notice of the first meeting of the British Association for the Advancement of Science, we made brief mention of an oil-gas lamp, which was exhibited to the meeting by the Rev. Wm. Vernon Harcourt, and a description of the instrument has since appeared in the First Report of the Association. We observe, however, that in the Franklin Journal for the last month, Dr. Jones states that Mr. Harcourt's lamp "corresponds precisely" with that patented in the United States by Dr. Andrews, April 15, 1831, and described in the last Volume of the Mechanics' Magazine, p. 296.

Expedition in Search of Captain Ross.—We are happy to perceive that the friends of this gallant officer have, in compliance with the recommendasions contained in this and other Journals, opened the subscription for the projected expedition to the public at large. It cannot, surely, be many days before all the money wanted is subscribed. At a public meeting held on the subject on Thursday, Sir George Cockburn, the Chairman, feelingly observed:—"The first object of Captain Ross had been to reach the wreck of the Fury, and it was probable he had, with his nineteen companions, succeeded in doing so. If this was their actual position, they had the means indeed of maintaining themselves in it, but none whatever of escape, without assistance from their countrymen. It was possible that this gallant band often ascended a rising ground, in the hope that they were not forsaken by their countrymen; and that they would not be left to perish without a hand being stretched forth to save them. He (Sir G. Cockburn) would not believe that nineteen sailors, who had felt no hope of gain but the advantage that would result from their exertions to this country, would be allowed to return in vain at every season of darkness to their miserable night without a struggle being made for their lives. £3,000 would be sufficient for this purpose, and he could not imagine that in London, where so much was contributed to ordinary charity, where the East India Company, the Trinity-house, and the merchants' companies were—there would be a difficulty in raising such a sum. It was impossible. An officer, Captain Back, acquainted with the country, had, in a very manly manner, offered to conduct the expedition. Government also was not reluctant to lend its aid. Lord Goderich had not only taken a personal interest in the case, and contributed very liberally, but had recommended a grant from the Treasury of £2,000. (Cheers.) Thus assisted and encouraged, the expedition could not be allowed to fall to the ground. Of Captain Back's ability there could be no doubt. On a former occasion he had saved the lives of a similar party, and if assisted with money, he (the chairman) had not the slightest doubt of his succeeding in the objects of this expedition. Should it unfortunately happen that their countrymen were no longer alive, yet their fate at least would be ascertained, and, moreover, the survey of the north-eastern coast of America would be completed."

INTERIM NOTICES.

The Supplement to the last Volume is now ready; also the Volume complete, in boards.

Communications received from Tempora—Mr. Bayley—Mr. Baddeley—Mr. Harrison—Mr. Drewry—A Warning Voice—Saul Pinnin—A Sportsman.

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Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

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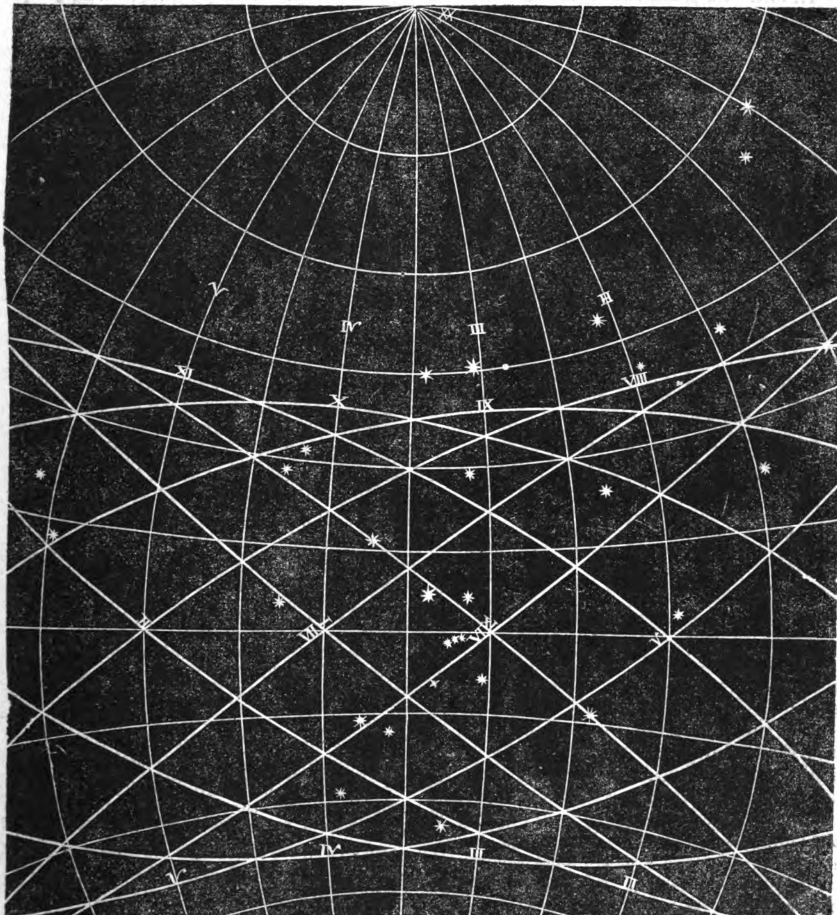
WOOLLGAR'S IMPROVEMENTS IN CELESTIAL MAPS.



PLAN OF AN IMPROVED SET OF CELESTIAL MAPS. BY J. W. WOOLLGAR, ESQ.

Sir,—A general acquaintance with the features of the starry heavens is an acquisition of a pleasing and useful nature, and is to be considered as forming part of a liberal education.

Nevertheless, efficient instruction in this particular is rarely to be found in elementary Treatises on Astronomy, which for the most part are devoted to the phenomena of the solar system. This defect is attempted to be supplied by Treatises on the Globes,—Astraria,—Guides to the Stars,—Portraitures of the Heavens, &c.

As to the first, a globe is a very inconvenient instrument for the purpose. To say nothing of its cost, the necessary inversion of place, and substitution of a convex for a concave surface, form a great impediment to learners. Nor is this latter objection at all removed by any projection on a plane of a half or greater portion of the sphere, as is exhibited by the moveable Astrarium of Wollaston, or the fixed one published by Marsh.

From these we turn to the opposite extreme, which adopts representations of separate constellations; such as are given partially in the work entitled "Wonders of the Heavens," and in that most clumsy and blundering production, Greig's "Astrography," and more completely, in the elegant but expensive set of cards, entitled "Urania's Mirror." The best of these are objectionable from their varying scales, and from their destroying the connexion between adjoining constellations, as if this parcelling out of the heavens in this way were not a completely arbitrary scheme, which persons, who pursue the study of the heavens to any extent, soon find it necessary to disregard.

In my judgment, the most useful assistants to beginners, are the twelve "Positions of the Heavens," subjoined to Mr. Frend's Evening Amusements for 1806," although confined to verbal description. That volume was the companion of many an evening hour of my boyhood, as I have reason to believe it has of that of many others. But the form in which they were published, must by this time have had the effect of withdrawing them almost entirely from the public eye. If a fuller description were to be published, upon the same plan, as a distinct work, illustrated by a set of maps, such as I am about to describe, I am convinced that the public would be furnished, at a very small cost, with greater facilities to an acquaintance with the Starry Heavens * than are afforded by any extant publication of small price.

My proposed set of maps would be four in number, each comprising more than one-third of the portion of the sphere visible in our latitudes. The annexed diagram (upon a scale about half of that which the actual maps would require) will serve to illustrate the scheme. The projection is stereographic, on the plane of a meridian comprising each 140° of Right Ascension, with 130° of North Polar Distance. I adopt twelve positions of the heavens (differing from each other two hours of Rt. Asc.), which are denoted severally by Roman numerals; and I construct a simple table, by means of which the student may at any day and hour determine, at sight, which of those positions corresponds (or nearly so) with the appearances of the heavens at that moment. I distinguish the visible hemisphere into five regions: one comprises the part in the vicinity of the zenith; the other four, those in the neighbourhood of each of the cardinal points of the horizon, and extending upwards to meet the zenith portion. On the maps are drawn certain lines, representing portions of the horizon, and at different points on those lines are placed the Roman numerals, denoting the several positions; so that whether the student look toward the Eastern, Western, Northern, Southern, or Zenithal region of the heavens, he can, by means of these horizontal lines and numerals, immediately refer to the corresponding portion of one or other of the maps, and compare it with the face of nature, free from any inversion or sensible distortion. If the entire hemisphere, at any one time be required to be surveyed, all the four maps will be successively brought into use.

In the diagram are only inserted the stars of the 1st and 2nd magnitudes, and the names even of those are omitted for the sake of simplicity. But the actual maps should comprise all the stars of the first four magnitudes, with such of the 5th as form parts of particular groups or remarkable configurations. The boun-

* I mean such as is to be attained without the use of a telescope.

daries also of the constellations should be inserted, but not the figures, which only perplex the mind with associations which it is not easy afterwards to dismiss.

I am, &c.,
J. W. Woollgar.

Lewes, 20th October, 1832.

IRON STEAM-BOATS.

Sir,—In a recent number of the Mechanics' Magazine, I perceive that you have intimated, that it is your opinion that iron boats are heavier than those built with wood, on account of the greater density of the metal. *

Although it is true that an iron plate, of the thickness proposed, would be equal in weight to a 3½ inch oak, it does not therefore follow, that an iron boat will necessarily displace a larger volume of water than one built with wood; for it must be borne in mind that, in vessels of the ordinary construction, the timbers and plank of the flat of the bottom would average say 12 inches in thickness, and the sides 7 or 8 inches; so that it is evident that *even* if the iron ribs were equal in weight to the external plate, yet the iron boat would be the lightest, and the draught of water less, *ceteris paribus*. I perceive by the papers, that the light draught of water of the iron steam vessel is stated to be 11 inches, and with the engine, &c., 22 inches fore and aft. This easy draught of water indicates an unusually full body, or the immersion would have been greater.

The present trial has, I consider, demonstrated that an iron steam-boat is lighter than one of wood, and is therefore preferable where the depth of water is limited, as in canals, &c.

Whether iron steam-boats are more durable than those of wood, remains to be proved; but something like an approximation to a correct opinion might be made by a reference to the iron canal boats which have been constructed at different times within the last five years. It would, however, be necessary to bear in mind, that steam-boats are subject to an additional cause of decay, arising from the action of the bilge water, which frequently becomes highly saturated with an acid which rapidly corrodes the iron exposed to its influence. I have seen the holding-down bolts of an engine corroded nearly one-third through, in about three years time, in those parts which were exposed to the bilge water,—an effect which I have never seen produced in so short a time in any other class of vessels.

With regard to their economy, it appears that some members of the Society of Civil Engineers have stated it to be their opinion, that they are more costly than vessels of the ordinary construction, in the ratio (I think) of 90 to 120. I speak doubtingly as to the proportion, writing from recollection, and not being able, just now, to refer to the proceedings of the meeting at which this statement was made.

Perhaps I have no right to question the correctness of this opinion, particularly as I may be reminded that it is founded upon the actual cost of one or more vessels which have been constructed with iron. This may be perfectly correct; but it does not follow that there may not be found those who, having a clear conception of the form of the vessel required, would be able to proceed in such a manner as to economise both material and labour, and produce a vessel suitable for the intended purpose, at the same or even less cost than if built with wood. The inaptitude of the workmen employed must have greatly increased the expense There is a certain kind of skill requisite in every handicraft, which can only be acquired by practice. A good joiner or cabinet-maker would make but a bungling boat builder in his first essays, for want of that practical acquaintance with some of the most important principles of naval architecture, by which he would be enabled to obtain the desired form with the least loss of time and labour, and of course with the greatest certainty. We are able to give the precise length, form, and bevellings of every timber required in the frame of a ship, and, were it required, the length, form, curvature, and twist of every plank in the bottom. In fact it may be said to be done by every boat-builder; for, as is very well known, clench-work boats are generally built without any moulds to guide the workman in the form of the bows and quarters. He gives greater or less fulness at his pleasure, by varying the form of his boards.

* The opinion we expressed was rather to this effect, that vessels which would answer well enough for river navigation, *could* be built lighter of wood than of iron. See last vol., p. 303.—Ed. M. M.

If similar methods were adopted in the construction of iron boats, I feel persuaded that they might be furnished at the same, if not less cost, than those of wood,—to say nothing of the opportunity which this change of material affords of introducing the most approved models, under the most favourable circumstances, for securing velocity and seaworthiness. The practice of the United States seems to indicate that an easy draught of water is essential to their velocity; for it is well known, that the most recently built steam-vessels in the States draw but very little water in proportion to their size, as compared with English boats of the same dimensions; and yet some of their new boats are propelled with great velocity. For instance, "The North American," whose form is described as "spoon-shaped," although about 700 tons burthen, and drawing about four feet six inches water, has performed the voyage from New York to Albany (160 miles) in ten hours and ten minutes, and returned from Albany to New York in ten hours and twenty minutes.

The trial of the recently-built iron steam-vessel, proves that the draught of water might be greatly reduced by using iron for the construction of steam-vessels, instead of wood. This greater lightness would afford an opportunity of taking a larger quantity of coal, whilst, in consequence of the reduced resistance arising from the small draught of water, *less power* would be required to obtain the same velocity as the boats already in existence.

There is another consideration which ought not to be overlooked, viz. the greater security from fire. It is well known that certain kinds of coal abound in pyrites, and if moist and kept in a warm place, that they will soon ignite spontaneously. The Enterprize was detained on her voyage outward to India from a fire, which there is reason to suppose was occasioned in this way. I was once on board a steamer, in which a fire broke out from this cause, and had we not been able to get at it, it must soon have destroyed the vessel.

With regard to the comparative strength of wood or iron boats, I am decidedly of opinion that the latter are the strongest, inasmuch as every part admits of a more intimate and secure connexion with the other, than can be obtained with wood, and at a cost altogether out of the question.

The *present* low price of iron is favourable to the experiment of iron steam-boats, as I have no doubt but that a plate could be furnished, well adapted for the purpose, at a much lower rate than a *boiler plate.*

I might extend this paper to much greater length, but I forbear, lest I should exhaust your patience, and weary your readers.

Yours, &c. GEORGE BAYLEY.

P. S.—I perceive that, from the illegibility of my MS., you have stated *M. Manestier* to be the author of the Memoir on the Steam-boats of the United States, instead of *M. Marestier.*

Page 424, note, instead of "*massy perpendicular sides,*" read "*nearly perpendicular sides.*"

Page 425, line 6 from the top of the left-hand column, the decimal point is omitted: it should be "4. 5 *Metres,*" as is evident, on reference to the note at the bottom of the column.

MR. HANCOCK'S STEAM-COACH AT BRIGHTON.

Sir,—Having received an intimation that Mr. Walter Hancock's steam-carriage, the "Infant," was on the road to this place on an experimental trip, I went to meet it 8 miles on the London road yesterday morning, and came with it from thence into Brighton. We travelled at the rate of between five and six miles per hour up the steep hill at Pie-Comb, and descended at the rapid rate of full thirteen miles per hour, proceeding afterwards steadily into the town, at ten miles per hour. Mr. Hancock made a detour round the North Steyne enclosure up to the Palace Gate, and returned to the Tank near the New Church, where he stopped half an hour to take in coke and water, and proceeded immediately on his return to London.

This unexpected visit excited very great interest along the road and in the town, and caused an instantaneous assemblage of the entire neighbourhood, who greeted Mr. Hancock with three hearty cheers. I understand from some of the gentlemen who accompanied Mr. Hancock from London, that the only inconvenience experienced on the road arose from want of proper relays of coke and water, and that they travelled at the

rate of from nine to eleven miles an hour on the more level parts of the road, and from five to seven up the hills. The coke for the first part of the journey was procured in London, and for the latter part from Brighton. A fact worth notice was elicited from this circumstance; namely, that it was much more difficult to keep up the fire with the Brighton coke, and that a much greater quantity of it was consumed than of the London coke, in proceeding equal distances:—a circumstance I have found, on inquiry, to be satisfactorily accounted for by the use of *clay* retorts at our gas works, which enable the proprietors to extract 12,000 feet of gas from a chaldron of coals, while the iron retorts used in London limit the operation to 10,000 feet. Thus the London coke is obviously less exhausted of its carbon, than that which is sold at the Brighton gas works.

This experiment is considered here as a very satisfactory proof of the practicability of travelling by steam on *common* roads. There are several long and steep acclivities between London and Brighton, particularly Red-hill, Hand-cross-hill, and Pie-comb-hill; all of which were gallantly ascended, and the roads were generally wet and heavy.

Mr. Hancock's visit has become a subject of general conversation, and a hope is universally expressed, of soon seeing him again in our town, with his new steam-carriage, the "Æra."

Yours, &c. C. A. Busby.

Stanhope-place, Brunswick-terrace,
Brighton,
Nov. 3, 1832.

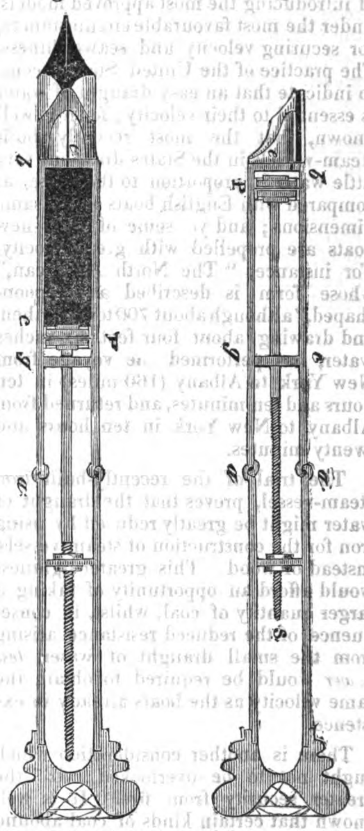
FOUNTAIN PEN-HOLDER.

Sir,—Various expedients have at different times been resorted to, for the purpose of obtaining a self-supplying or perpetual pen, which should combine, in a portable form, the valuable offices of pen and inkstand, and also save the penman the trouble of constant dipping. Nearly all of them, however, have been objectionable, principally on account of the irregular flow of ink, the supply not being under sufficient controul. The following arrangement appears to me to possess considerable claims to superiority, being free from the above and other defects, to which former contrivances are liable.

The idea is partly borrowed from Mordan's celebrated ever-pointed pencil, and partly from a fire-engine described by Cyprian Lucar, Gent., in his treatise called "Lucar Solace," published in the year 1590; in which engine a piston was worked, and water projected, by means of a screw cut on the piston-rod.

In the accompanying sketch, fig. 1, is

Fig. 1. Fig. 2.



a longitudinal section of the pen-holder, of the full size; consisting of a gold or silver case in two parts, which turn freely on a joint at *a*. In the lower portion of the case *b c*, a cupped piston P traverses, by means of the screw S on the top of the piston rod, the lower half of which is square, and works in the guide plate *g*.

D is a female screw or nut fixed to the upper part of the case, and turning with it; when this portion of the case revolves, it either raises or depresses the piston P according to the direction in which it is turned, the piston itself being incapable of rotating in the lower part of the case.

The pen-holder is screwed into the bottom of the tube, and has a small hole *e*, which is the passage for the ink. The case being held with its lower end immersed in a vessel of ink, the upper half is turned round, and the piston raised, which fills the reservoir with ink, when it is ready for use as shown by fig 2. When required for writing, a few turns propels the ink through the passage *e* into the pen, which may be either of quill or metal. When the writing is finished, the pen being held upwards, and the motion of the piston reversed, the remaining ink is returned into the reservoir for future use.

To prevent the ink from exerting an injurious action on the reservoir or pump-barrel, when of silver, it should be gilt as far up as the guide-plate *g*; or a glass tube might be employed for the pump-barrel.

These pen-holders are simple in their construction, efficient and cleanly in operation, and would be particularly useful to travellers, short-hand writers, and others; as one, the size of the drawing, would contain ink enough to last a great length of time. They may be made very plain and cheap, or as elegant and costly as luxury may dictate; they will not be very liable to derangement, but when out of order, they may be repaired with great facility.

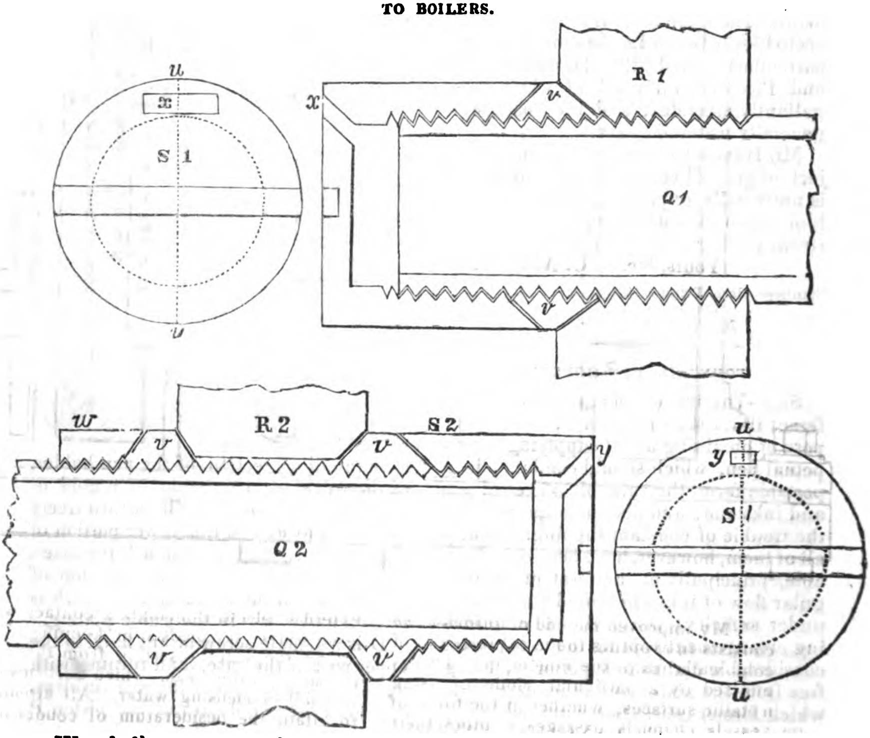
There would not be much difficulty in adapting them to sliding cases, and using a Bramah's holder; but I have shown the most simple form of the instrument, which only requires the addition of a cap for the pen, to admit of being carried in the pocket.

I am, Sir, yours respectfully,

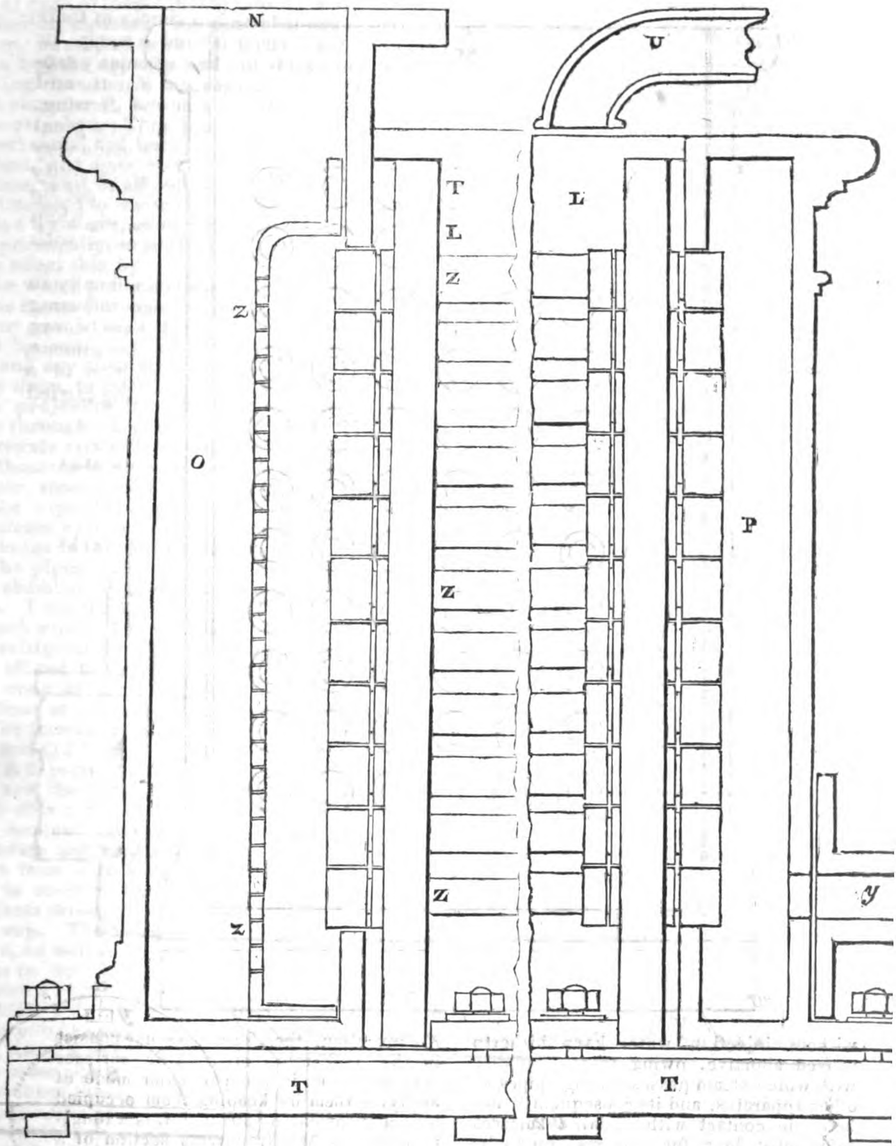
W. BADDELEY.

London, Oct. 25, 1832.

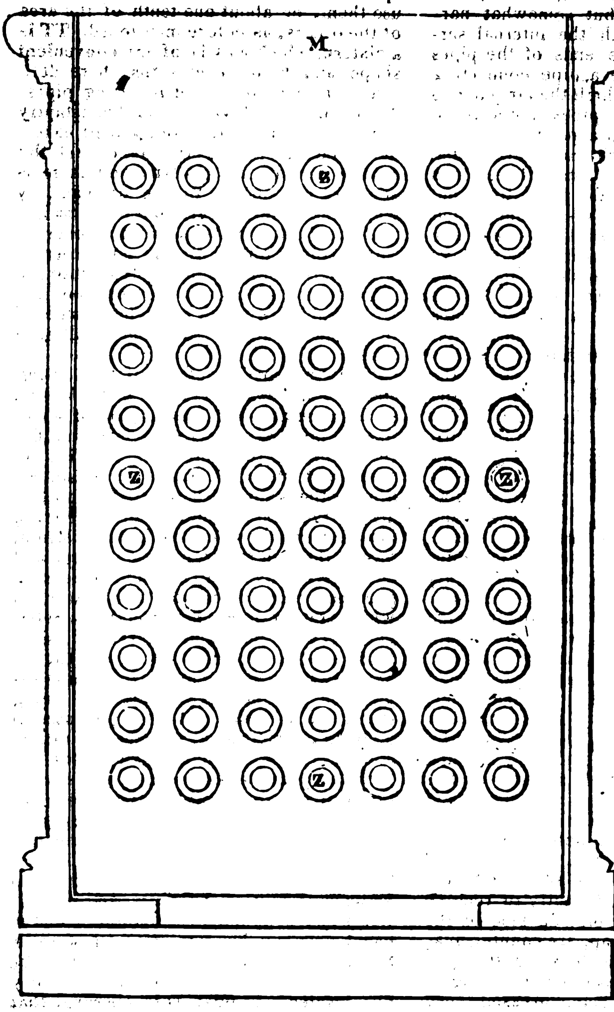
HALL'S IMPROVED METHOD OF CONDENSING STEAM AND SUPPLYING WATER TO BOILERS.



We shall now proceed to give Mr. Hall's account of his new method of condensing steam and regulating the supply of water to the boilers:—



"My improved method of *condensation* consists in avoiding the usual injection of cold water into the condenser. This is effected by a particular mode of using metallic surfaces, whether in the form of vessels, channels, passages, or pipes, their external surfaces being in contact with cold water, it consists in keeping them full of the water resulting from the condensation of the steam, which becomes the internal condensing water. All attempts to attain the desideratum of condensing



without injection water have hitherto proved abortive, owing to the rapidity with which steam passes through pipes or other apparatus, and its consequently not being in contact with metallic surfaces sufficiently long for condensation to be effected; but by my method of causing the steam to pass through the pipes or other apparatus in its condensed instead of its uncondensed state, it is nearly 1800 times longer in its passage, and in contact with the metallic surfaces, than if it were to pervade them in the uncondensed state. My invention, therefore, does not consist in the application of metallic surfaces generally, but in the particular mode of applying them by keeping them occupied by water instead of steam. L is a longitudinal, and M a transverse section of a system of metallic surfaces, which I call a refrigerator in the form of pipes Z, which I call refrigerating pipes. N is a pipe leading from the working-cylinder to the condenser; O is the condenser, being a chamber connected with the internal surfaces of the refrigerating pipes, by one

end of each of them entering into it; P is a similar chamber, ~~but somewhat narrower~~, connected with the internal surfaces by the opposite ends of the pipes opening into it. Y is a pipe connecting with chamber P, to which the air-pump is to be attached. These pipes should lie in as horizontal and level a position as convenient, and upon each end of every one of them must be affixed a cap. These caps are intended to cause the pipes to be occupied by water, as above-mentioned, and not principally, as is usual, by steam. The caps effect this by retarding the passage of the water produced by the condensation of the steam (through the pipes). In the upper part of each cap, a hole or holes must be made, to allow the steam, water, air, and any other matter that may accompany them, to enter into the pipes, by the ends projecting into the condenser, and pass through them into chamber P. The aggregate areas of the holes in the caps, on those ends which enter into the condenser, should be about equal to the area of the pipe that conveys the steam from the steam-cylinder to the condenser; and the holes in the caps on the opposite ends of the pipes, videlicit, those which enter the chamber P should be considerably less. I use them of about one-tenth part of such area. To show the mode in which the refrigerating pipes are passed through and affixed to the two plates which form the ends of the refrigerator, two small portions of the latter, and detached ends of the former, are drawn to the full size, Q 1 and Q 2 being the pipe-ends; and R 1 and R 2 portions of the plates; S 1 and S 2 are the caps which are put on the pipe-ends; S 1 showing the ends, and S 2 sections thereof, cut across in the direction and situation shown by dotted lines from *u* to *u* in S 1. The pipe-end Q 1 is screwed into the plate R 1, and projects through it sufficiently to receive the cap. The holes on one side of the plate, as well as the cap, are countersunk, so as to form a recess between them, to receive a cotton, hempen, or other ring of packing VV, which being pressed very tightly, by screwing the cap on the pipe-end, forms a sufficiently steam-tight joint. The other pipe-end, Q 2, passes in a similar manner through plate R 2, except that it does not screw into it, as pipe Q 1 does in plate R 1, on which account two joints are made at this end of the pipe, by the holes in the plate being countersunk at both sides thereof; one joint being made by the countersunk-cap, as before described; and the other by the countersunk-nut *w* on the other side of the plate. In the upper sides of the caps are cut the apertures *x* and *y*; the former being, as I ~~use them, of about one-tenth of the area~~ of the others, as before mentioned. TT is a cistern, which may be of any convenient shape and kind besides that here delineated, to contain the refrigerating pipes. A stream of cold water should constantly flow through it, and envelop their external surfaces. U is a pipe to conduct the cold water into the cistern; and there is another, not shown in the drawing, by which the water is carried away; *zz* is a plate perforated with a great number of small holes, placed in the condenser to equalise the entrance of the steam into the refrigerating pipes, and prevent its otherwise rushing with violence into some of them, and scarcely entering at all into others.

"My improved method of condensing steam, and *supplying water to the boilers*, so far as relates to the supplying of water to the boilers, consists in effecting the repetition of the following routine of water and steam through the steam-engine:—the water with which the boilers are in the first instance supplied having issued from them in the form of steam, passes through the working cylinder, and is then re converted (by the condensing process before described) into water, in which state it proceeds through the refrigerator, air-pump, and separators; when being separated by the latter from the oil or other lubricating matter, it is again supplied to the boilers, instead of being taken, as is usual, for that purpose on quitting the air-pump, without separation, and of course in commixture with the lubricating matter and any impurities contained in the injecting-water. The effect of this routine or method of supplying water to boilers, is, that the same distilled and separated water repeatedly enters into them, instead of the mixture of water with lubricating matter and impurities when supplied to the boilers in the usual manner. The trifling waste of water necessarily arising from working, may be supplied by distilled or other sufficiently pure water. I must here observe, that the water may be heated on its passage from the separators to the boilers, by the well-known means of passing it through pipes placed within the condenser; and that the separators and refrigerating pipes, as well as the boilers, should be filled with pure water preparatory to the working the engines."

It will be observed that Mr. Hall's different improvements are all intended to be used in combination, and are in some measure, indeed, dependent the

one on the other. His improved piston requires his improved mode of lubrication (or some other that will supply the oil in equal abundance), and both his mode of lubrication, and his mode of supplying distilled water to the boiler, require that the water should be condensed without the injection of water into the cylinder. The general result of his improvements is stated to be a "great increase of power in engines," and the consumption of "a much less quantity of fuel." Of this we understand ample proof may be seen at Mr. Hall's bleaching-works at Basford, where an engine, combining all his improvements, has been in successful operation for more than a twelvemonth. With an engine on the old plan, previously used, the consumption of coal in twelve hours was 22 cwt.; the consumption is now *only nine cwt.* The work done by the old engine was moreover full thirty per cent. less than that by the new. With respect to the working of the piston, Mr. Hall mentions in a note, which we overlooked when treating of that branch of his patent, "I have a piston which has worked for more than a year with steam of 200 lbs. pressure on the square inch, and, of course, upwards of 300° of temperature; its texture is not in the slightest degree injured; whereas without the lubrication, similar packing, under precisely the same circumstances, has become perfectly tender in twelve hours."

NEW PUBLICATIONS CONNECTED WITH THE ARTS AND SCIENCES.

Inland Transport, Art. V. Edinburgh Review for Oct. 1832.

The last Number of the Edinburgh Review contains an article under the head of "Inland Transport," which professes to have for its particular object to make the public acquainted with the progress made in the application of steam power to travelling on railways and common roads. It is written in a style of great pretension, but exhibits withal a very superficial and inaccurate acquaintance both with the details of the subject and with the scientific principles which bear upon them. We observe, too, in not a few instances, an extent of misrepresentation, with respect to well-established and well-known facts, which would seem to indicate that other interests than those of truth have guided the pen of the writer.

He starts with representing the performances which have been recently witnessed on the Liverpool and Manchester Railway as being such that, "had they been narrated *a few years* since, they could only have been admitted into the pages of fiction or volumes of romance." Now, it is written in the pages, not of fiction or romance, but of history, that not less than *fifty years* ago, Oliver Evans, of Philadelphia, established the practicability of propelling carriages by steam, and distinctly predicted that the time would come when steam-carriages would be "in general use for the transportation of passengers as well as goods, at the rate of 15 miles an hour, or 300 miles a day, on good turnpike roads;" which, on such roads, is equal to any thing that has been ever yet achieved on railways.

"So complete," according to the reviewer, was "the ignorance of the power of the locomotive-engine which prevailed, even among engineers, previous to the opening of the Liverpool Railway, that the transport of heavy goods was regarded as the chief object of the undertaking, and its principal source of revenue." But, on the contrary, so well were the powers of the engine foreseen, that in the Prospectus of the Railway it was expressly stated, that "the *travelling* between Liverpool and Manchester is upon the most extensive scale, and the economy to be effected in this branch of expenditure must be considered as *most important*, and *of itself* no small recommendation of the undertaking."

We further learn from this veracious critic, that "so great was the want of experience in the construction of engines, that the Company *was* at first ignorant whether *they* should adopt large steam-engines, fixed at different stations on the line, to pull the carriages from station to station, or travelling-engines to drag the loads the entire distance." It was a matter of doubt certainly with the Company whether they should employ travelling or fixed engines; but this arose from considerations of economy, which had little, if any thing, to do with "the construction of engines;" and even at the present moment it is by no means a settled point that travelling-engines are, under *all* circumstances, the most efficient. On a railway of so uneven a description as that between Liverpool and Manchester, speed as well as economy would probably be best consulted by employing both—travelling-en-

gines on the levels, and fixed-engines to work up the steepest of the inclines.

The results furnished by this railway are considered by the reviewer to establish conclusively the superiority of this mode of transport over that by canals; and so, doubtless, they do, though by no means to the extent which he would have the world believe. He insists on the universal applicability of the old rule, that the resistance to bodies moving through fluids increases in proportion to their velocities, and affirms that in the open sea this resistance is as the square of the velocity, but considerably more than that, in confined channels like canals—that "the greatest speed at which canals can be advantageously worked is from 2 to 2½ miles an hour"—and that if boats were propelled through canals, "at any rapid rate of motion," the "rapid flow of the water" would cause "destruction to the embankments." Now, it has been clearly ascertained by recent experiments on canals, published in this and other journals, that the rate of resistance, as quoted by the reviewer, only holds good as long as the immersion of the moving body continues the same (a fact which might have been, with good reason, inferred *a priori*)—that when horses are employed to draw boats on canals, the immersion, resistance, and surge all diminish after a time, in proportion to the velocity—and that, so far from a speed of "from 2 to 2½ miles per hour" being the greatest at which "canals can be advantageously worked," they are now actually worked to admirable advantage at the rate of 9 and 10 miles an hour, and that without any injury whatever being done to the banks. We allude to the experiments on the Ardrossan Canal, detailed in Mech. Mag. for Aug. 7, 1830, and July 9, 1831, and shall here extract some highly corroborative testimony on the subject from a letter which appeared last week in the *Glasgow Chronicle*, from an inhabitant of Johnstone, whose ire had been provoked by a perusal of the gross mis-statements of the reviewer:—

"What are the facts? Why, that I and the other inhabitants of this town and neighbourhood, and those of Paisley and Glasgow, are, at every hour of every lawful day in the week, conveyed along the Ardrossan Canal, between Johnstone and Paisley, and Glasgow, *at the rate of ten miles an hour*, and this speed of transport is made in convenient passage-boats, completely protected from wind and weather, and carrying each from 80 to 100 passengers. These boats do not occasion any flow of water on the banks of the canal, and the banks are now in the best condition, although the passage-boats have been running along the canal at this rapid rate for the last two years. The power employed to produce this speed is that of horses, and two horses without difficulty draw each boat, containing from 80 to 100 passengers, at the rate of 10 miles an hour. Whether or not this working the canal be an advantageous, "or a useful effect," (to use the learned gentleman's own language) I leave it for himself to determine; but this I know, that the inhabitants of Johnstone find it exceedingly advantageous, and useful, and convenient, to have it in their power, whenever they choose, to be conveyed between Johnstone, Paisley, and Glasgow at the rate of 10 miles an hour, and find it to be no less cheap than useful and convenient, the fares charged to each passenger being only *one penny per mile in the first cabin*, and *three farthings per mile in the second cabin*. Although this is, beyond doubt, the cheapest inland transport in Britain, and not one-half of the fare per mile charged on the Liverpool Railway, as appears from the documents quoted by the reviewer, yet the Canal Proprietors have found it so gainful a trade, and a working of their canal to so "useful an effect," that they have been regularly increasing the number of their boats, and of the trips made by them, during the last two years; and they are actually making a handsome revenue by charging, per mile, fares not exceeding the sum stated by the Liverpool Railway Directors, in their Reports, as the actual cost per mile of conveying passengers along their railway; or, in other words, the cost and profit charged by the Ardrossan Canal Company per mile for conveying passengers along their canal, does not exceed the actual outlay or cost expended by the Liverpool Railway Company per mile in conveying passengers along their railway. What I have stated are facts, which do not admit of denial. The Ardrossan Canal swift passage-boats have now been plying for two years, and the improvements effected by them are rapidly extending to various English and Irish canals. Accounts of the shape, construction, and speed of these canal-boats, and of the unequalled cheapness at which they can be, and are worked, had appeared in many of the provincial newspapers; and deputations from the Managers of many English and Irish canals have come to the Ardrossan Canal to have ocular proof of the effect of these improvements, so that the facts are, or ought to be, known to the learned author of this article or treatise on 'Inland Transport.'"

Although the reviewer makes no mention of these somewhat notorious facts he does advert to a set of experiments which were made on the Forth and Clyde Canal in July, 1830, and which, though they confirmed those on the Ardrossan Canal, were not altogether of so decisive a character. We are of course to understand, that it is from accident merely that the one has come to his knowledge, and not the other! As it is, he admits that the Forth and Clyde experiments did seem to establish that the boat was "raised out of the water by the effect of the traction," but he slightingly adds, "we can venture to affirm that a similar result would not be found to attend the propulsion of a boat by a steam-engine acting on paddle-wheels." A brave venture, in sooth! considering how analogous the two cases are—that of a boat propelled by a force, external not only to the boat, but to the canal, and that of a boat propelled by a force within itself, and which must therefore have, at all velocities, the same effect on the amount of water displaced.

The grand point on which the inferiority of canals turns, is the rate of speed. Although it is true, as the correspondent of the *Glasgow Chronicle* states, that passengers are conveyed on the Ardrossan Canal "at not one-half of the fare per mile charged on the Liverpool Railway," it is to be remembered that it is for a rate of speed one-half less than that realised on the railway. Horse-power is limited in its utility to 10 miles or thereabouts; and though steam-engines might be employed as well as horses to draw canal-boats, they must always work against a much greater resistance than that opposed to engines on railways, inasmuch as water is a thicker fluid than air.

The reviewer, after all, is not so favourable to steam on railways as on common roads. He enters into a long series of calculations to prove a fact which may be stated in plain English thus—the smoother the ascent, the more slippery it is; and having got hold of this wonderful discovery, he favours his readers with another series of calculations, to show that where there are many such slippery ascents or undulations in a railway, they must have the effect of reducing "the average rate of speed much more than similar inequalities affect the average rate on common roads." Perhaps so; but instead of concluding that steam-carriages will answer better on common roads than on railways, would not the more reasonable inference have been, that all railways ought to be constructed with as few of these undulations as possible? The reviewer himself makes certain admissions which put all cavilling on the subject aside; for he afterwards observes, that "the average traction of level turnpike-roads is about *twelve times that of railroads*; and, consequently, the same power acting on a railroad will always draw or impel twelve times the load which it can transport on a common road."

The only person, according to the reviewer, who has done any thing worth remembrance in the application of steam-power to travelling on common roads is Mr. Gurney; and the only rivals of Mr. Gurney, worth noticing, are Dr. Church and Mr. Hancock. "We are aware," he says, "*of but two other locomotive engines* which are in a sufficiently forward state to give early promise of being practically exhibited on the road. These are the inventions of Dr. Church, of Birmingham, and Mr. Hancock, of Stratford, Essex!" How far this statement is to be reconciled with common honesty, the reader will be enabled to judge, when we tell him that among the publications placed at the head of this very article on "Inland Transport," and repeatedly referred to in the course of it, is the "Report from the Select Committee of the House of Commons on Steam-Carriages," in which Report nothing whatever is said of the performances of any engine by any Dr. Church, but a great deal of an engine by Messrs. Ogle and Summers, which has been many a time and oft—both before the Report and since—"practically exhibited on the road." We could mention two or three locomotive-engines besides this, which the reviewer must have known to be "on the road"—but we content ourselves with referring to this single exception, and challenge him to explain, on any just or honourable ground, the omission of which he has been guilty.

The reviewer makes the same objections to Mr. Hancock's engine which Dr. Lardner does in the last edition of his Lectures on the Steam-Engine. The objections, indeed, are so much alike, as to lead one to suspect that the lecturer and reviewer are one and the same person! For example, the reviewer makes the same stupid blunder about the concave form being the most favourable to the resistance of pressure, which the lecturer does in his notice of Mr. Hancock's engine, and which was so justly animadverted upon by our correspondent, Mr. Vere, in our last Number. It is barely possible that two different individuals should have stumbled on the same remarkable blunder.

The general character of the article is, it must be confessed, very much in unison

with the suspicion that Dr. Lardner is actually the writer. It is distinguished by the same qualities precisely by which Dr. Lardner's avowed publications on steam are distinguished—the same disregard for facts—the same deficiency of scientific and practical knowledge—the same likings and leanings—the same sort of blunders—the same junction of mere cleverness with unbounded arrogance and conceit. But why need we raise a question about the authorship? Are there not whole passages of the review which are nearly literal transcripts of passages in Dr. Lardner's book? Would any person but Dr. Lardner himself have made so free a use of his book without acknowledgment? Would any person but Dr. Lardner have borrowed from Dr. Lardner on such a subject? Either the reviewer is Dr. Lardner in *propria persona*, or he is at once the most impudent and most tasteless plagiarist that ever figured in print.

The Penny Press.

With all due submission to T. M. B., and the rest of the assailants of a former paper on the subject of the Penny Press, the writer begs permission to resume his strictures. "Wherein he has offended" on the former occasion, he knows not; he can only hope that his present remarks may be better adapted than their predecessors to accomplish the hopeful task of "pleasing every body." To plunge at once *in medias res*:—

The Doctor is a "Medical Penny Magazine," containing each week a *cut*, and eight quarto pages of letter-press, for the numerous ills that flesh is heir to. It is much to be feared that, if this penny Doctor's prescriptions were to be taken, a considerable reduction in the amount of population would be the inevitable result. Some benevolent persons took the trouble, through the medium of the newspapers, to warn his ignorant patients against a dose prescribed by him for a common ailment, which, it appeared, was quite sufficient to give a dozen men their quietus! We hope that, "in this enlightened age," such warnings are unnecessary; if they are not, the penny Doctor should be stopped from practising without delay.

The Penny Lancet is a complete plagiarism, in every point of manner and appearance, from the older practitioner, and we dare say his advice is worth *just as much* as his master's.

The New Penny Magazine is an attempt, on the part of an individual publisher, to push the Society for the Diffusion of Useful Knowledge from their stools. We are afraid, however, that the original articles are more ambitious than excellent: the editor seems to make use of more long words than he well knows the meaning of. The book is well printed—much better than the *Old* Penny—and, as if to corroborate a former remark on the Society's misfortunes in the graphic department, the embellishments are executed, both by engraver and printer, in a far superior style to those "published under the superintendence of" the scores of Peers and Parliament-men who compose the Brougham Society Committee.

The Christian's Penny Magazine is a religious pamphlet, got up in the style of the all-envied *Penny*—and so got up and got *out*, it is to be observed, some weeks before the Christian Knowledge Society crossed its path with their *Saturday Magazine*. It keeps its place gallantly still, in spite of its hydra-headed adversary, and will perhaps continue to do so, for its contents are more decidedly of a serious character than those of the latter publication; more like, in short, what the contents of *The Saturday Magazine* were generally *expected* to be. As, therefore, much dissatisfaction has been evinced in the religious circles at the comparatively worldly complexion of the Society's articles, (and there is certainly a demand for such a periodical as *The Christian's Penny*,) it may still command a pretty extensive circulation. It is understood that the editor is the Rev. J. F. Denham, the popular preacher of St. Clement's and St. Bride's.

The Evangelical Penny Magazine is a publication of the same kind, but of a more *dissenting* cast. Its main graphic attractions are wood-cut portraits of celebrated Ministers, which are naturally expected to create a demand for the work among their admirers, and especially in the neighbourhood of their respective chapels.

The Tourist is a deception: it aims, by the attraction of its title, at the promotion of the sectarian views of a certain politico-religious party in Parliament.

The Maids', Wives', and Widows' Gazette of Fashion is the fortunate work whose proprietor contrived to attract so much attention by industriously placarding the walls of the metropolis with the mysterious warning—"Maids, Wives, and Widows, look to the 27th October;" an i[illegible]mation which had reference not to such trifling matters as the comet, or the destruction of the world, but to the advent of this—a new penny periodical! In another particular fortune was not so friendly—to wit, in the stirring-up of a rival bookseller to the feat of getting out another periodical of the same pretensions,

and intended for the same classes, on the very same day. The worst of all, too, was, that the new-comer was by far the best of the two: while the original contained only one solitary cut, and that merely illustrative of an every-day piece of poetry, the other treated its purchasers to three figures of the latest French fashions, quite in the style of *La Belle Assemblée*—a view of the "Toilette"—the "working pattern" of a new bonnet—and a piece of music for the pianoforte!!! Enough, in all conscience, for the money, considering the 24 columns of letter-press into the bargain—and that the leading article, the musical review, and the dramatic notices, are by no means contemptible specimens of "original composition."

The Poor Man's Guardian, and *The Cosmopolite*, are two scampish newspapers, which are ostentatiously printed in defiance of the law, without a stamp, and enjoy the rare privilege of being advertised daily in every newspaper throughout the kingdom for nothing. The latter advantage they owe to the judicious kindness of his Majesty's Ministers.

The People's Penny Library is a re-issue of an edition of the most popular British novels, which originally appeared some years ago, when a whole sheet of well-printed paper was not accounted dear at the original price of the work in question—twopence.

The Penny Trumpet has for its editor no less a personage than "honest Tom Dibdin," who, if not an excellent, has certainly been a very industrious writer "in his day," having produced a century or two of plays—good, bad, and indifferent. This new attempt betrays rather too much of the last quality; the puns are something like the Yorkshireman's horse—very far-fetched, and often not worth the fetching. Some of the articles, too, have no more piquancy than may be imparted by the important heading, "by the Author of Mother Goose," or as the case may be. Mr. D. must resist the temptation of making his trumpet the medium of a *puff* of his own handywork, and his publication may then attain the high distinction of being pronounced "worth a penny!"

The Boys' and Girls' Penny Magazine is intended, as the title imports, solely for the gratification of the "interesting little race of children," an end which it proposes to attain principally by reprinting the standard novels and romances of infancy—Blue Beard, Jack the Giant-Killer, &c.—with wood-cut illustrations of an enormous size, most gorgeously *coloured;* the latter quite a new feature.

The Girls' and Boys' Penny Magazine is a mere imitation of the former, provoked, perhaps, by its success; it is, however, of smaller dimensions, but similar in contents; and the "pictures," although more finely executed than those of its prototype, are neither half so large nor half so grand.

The Talisman, and *The Miniature Library*, are two tiny periodicals, apparently intended for the same class of readers as their gigantic rivals aforesaid. Their whole getting-up, however, partakes more of the old school than the new; their attractions consist of coloured copper-plates, given in *The Talisman* only occasionally, and in *The Miniature Library* every week, while the letter-press is usually composed of "Magic and Terrific Tales," few of which are original. *The Miniature Library* is intended, however, to form a very extensive work, the "Brigand Tales," now publishing, being the fifth series. The preceding have included, among others, "The Lives of noted Highwaymen,"* and "Dramatic Tales," founded on the new pieces produced at the various theatres. The price originally was twopence per Number, a charge which could not stand against the onslaught of penny competitors.

We come now to the very interesting question, What is the tendency of this inundation of cheap literature—to good or to evil? It is too much to be feared, the latter. Some of the works we have been noticing display a degree of talent quite extraordinary, when their excessively low price is taken into consideration; others, however, show nothing of talent, but the want of it; and the majority depend for their contents on a regular system of the most shameless pilfering, or rather wholesale robbery, from their more costly and aristocratic brethren; a system which is coolly continued by the plundering many in spite of the ceaseless cries and occasional kicks of the plundered few. Literary robbery, we are aware, is looked upon with a lenient eye, but still such barefaced thieving as is now the order of the day, is "really too bad," and enough to give an ill name to the whole republic of letters; for it seems unfortunately to be the case, that the "Penny Press" has a tendency to reduce every thing to its own level. What that level is may be inferred from the perusal of a Number of *The Guide to Knowledge*, a work professedly edited by the author of a Catechism (amongst others) of English Grammar, but which displays, in every sentence, an ignorance of the very first rudiments of

* Fine food, by the way, for the youthful mind!

Lindley Murray, which is absolutely astonishing. Valuable, indeed, must be the *knowledge* gained by the lower classes under the direction of so competent a *guide.* The extent and worth of the information he so elegantly sets forth, may be guessed at from the fact, that in his "Life of Sir Walter Scott," not one of all the numerous series of the Waverly novels is alluded to, except the "head of the clan," Waverly itself! Even this is not so bad, however, as the conduct of the editor of *Chambers' Edinburgh Journal*, who actually ventured so far to play on the ignorance and credulity of "the reading public," as to put forth a "Life of Sir Walter," bearing in every line the marks of *breathless haste*, as the product of *ten years'* industrious and indefatigable research; and this while the memoir was so palpably defective, that the very titles of some dozen of the works of the veracious editor's illustrious countryman were omitted. Conduct such as this must surely lower the standard of even "literary morality."

Perhaps, however, the worst effect of these penny publications is yet to come—the effect foretold in the Mechanics' Magazine of 1827. They are at present in their hey-day; competition is at its height; and, hitherto, the printers have been quite as adventurous in the execution of "orders" as the most fashionable tailors of Bond-street. The time will shortly come, however, when the effervescence will be over; when the printers will see the impossibility of profit from a penny work whose getting-up costs twopence; and when none but two or three of the cheap periodicals in most extensive circulation will be able to stand their ground. Which will those two or three be? Most probably the publications issued by the great corporate Associations, who, by the aid of their large subscribed capital, are at once crushing into bankruptcy the individual publishers in their "line" (or rather "lines"), and endeavouring, for their own party purposes, to monopolise the instruction of the lower orders. The most pleasing hope to be indulged is, that when the field is left to these alone, the rival combatants will display as much spirit as the Kilkenny cats, who fought till they left only the tips of their tails!

I shall conclude by giving a list—as complete a one as I can possibly make—of "The Penny Publications" at this present moment in existence; at least one hundred have already "had their little day:"—

1. National Omnibus.
2. New Entertaining Press.
3. Casket.
4. New Casket.
5. Scrap Book.
6. Penny Magazine.
7. Saturday Magazine.
8. New Penny Magazine.
9. Christian's Penny Magazine.
10. Evangelical Penny Magazine.
11. Figaro in London.
12. Boys' and Girls' Penny Magazine.
13. Girls' and Boys' Penny Magazine.
14. Talisman.
15. Miniature Library.
16. Guide to Knowledge.
17. Penny Cyclopædia.
18. Maids', Wives', and Widows' Penny Magazine.
19. Ladies' Penny Gazette.
20. Doctor.
21. Penny Lancet.
22. Penny Trumpet.
23. People's Penny Library.
24 to 32. National Penny Library (12 separate works.)
33. Songsters' Casket.
34. Comic Singers' Album.
35. Tourist.
36. Cosmopolite.
37. Poor Man's Guardian.
38. The Ladies' Weekly Fashions.
39. The Book of Wonders.
40. The Cabinet Songster.

F. H.

Oct. 30, 1832.

ANSWERS TO INQUIRIES.

Algebra.—We think "A Self Learner" will do right not to trouble himself with Algebra, till he experiences some difficulty in calculation which common arithmetic cannot readily solve. Algebra is not of itself knowledge—only an instrument for facilitating the acquisition of it.

Spirits from Mangel Wurzel are authorised to be distilled, by an Act passed during the last session of Parliament.—C. Q. should consult the Act itself, a copy of which he will find no difficulty in procuring at the office of the King's Printers.

Wheels of Stage Coaches. — The distance between the wheels of a coach ought, of course, to have a proportional relation to the height of a vehicle; but what does "A Coachmaker" mean by the inquiry? He can have made few coaches, who does not know that the distance is regulated both by a principle of necessity and (as if the necessity were not enough!) by various statutes for the regulation of stage coaches.

Painting in Sand. — Sir, The art of sand painting, respecting which your Correspondent, "Tranquil," requests information, is, I believe, confined to a very few individuals. But Mr. G. Zobel, son of the original inventor, is able to give instructions in this beautiful species of drawing. I enclose Mr. Z.'s address, for the use of your Correspondent. —And I remain, yours truly, Dunbar. London, October, 31, 1832.

[Mr. Z.'s address may be obtained on application at our office.]

Maps.—Sir,—In reply to an enquiry in the Mech. Mag., for 6th October last, I beg to inform "C. T. V.," that my father has two maps of the globe, di-

vided into northern and southern hemispheres, and projected from the poles to the equator, which were published by "W. Faden, Charing-cross, in May 1802."—Yours respectfully, M. S.L. Friday-street, Nov. 2, 1832.

MISCELLANEOUS.

Boot and Shoe Trade.—"There is no article in any branch of the colonial trade, which is so pregnant with extortionate charges, as the boot and shoe making business. A pair of colonial manufactured boots will cost you at least 40s., and a pair of shoes, 12s. The journeyman's wages alone, are said to be 18s. for the workmanship of a pair of boots, and a good workman can knock off a pair in a day and a half at farthest. Twelve shillings a day wages! In London the same article can be bought at 25s. What surprises us is, that leather should fetch the price it does, where the raw hide can be bought so cheap."—*Sydney Gazette*, 19th *June*, 1830.

The largest room (perhaps) that ever was built, is the tobacco store-room in the London Docks, which consists of nearly six acres of ground, under one roof. Strange that in an age, when the cry of distress is loud and universal, the largest store should be a store of trash—luxurious trash, to be sure, but such trash as is neither food, drink, nor raiment!

Supplement to the Description of Baron Drais's Improved Velocipede, (Mech. Mag. Sept. 29, 1832,) *by Baron Drais*.—The difference between the velocipedes formerly in vogue in this country, and the improved velocipede consists chiefly in this:—1. That by means of the elongated elastic seat, and the supporters of the arms, the jolts, occasioned when coming in contact with stones, are broken, and, therefore, cannot possibly cause any injury to the body. 2nd. That the construction of the improved velocipede facilitates both its management and the keeping the balance.

Forgery of Stamps.—The walls of the town are covered with placards, offering a handsome reward for the discovery of the forgers and issuers of a large impression of spurious receipt stamps, which have found their way into the market. Two questions suggest themselves:—1st, Are the stamps *really* forged—that is to say, produced from any other than the government dies?—2nd, Is there any check by which the number of impressions from the government dies can be positively ascertained? We apprehend that neither of these questions can be satisfactorily answered; and yet, when Mr. Reilly offered to the Duke of Wellington his infallible stamp register, he was told that nothing of the kind was wanted!!!

American Silk.—The cultivation of mulberry trees and silk worms, in various parts of the United States, is rapidly extending. Orchards, containing as much as many as 100 acres, are now exclusively appropriated to the purpose. *The New England Farmer* says, a gentleman in Mansfield, Connecticut, had upwards of 10,000 skeins of sewing silk, which readily sell for about eight dollars fifty cents per pound. Machinery is now being completed in that town for spinning and weaving the raw material, under the direction of competent foreigners. The sales of sewing silk alone in Mansfield this year are estimated at more than 85,000 dollars.—*Nile's Register*.

Double Sounds.—When sound is transmitted along an iron wire or an iron pipe of sufficient length, we actually hear two sounds, one transmitted more rapidly through the solid, and the other more slowly through the air. The same property is well illustrated by an elegant and easily repeated experiment of Chladni's. When sparkling champagne is poured into a tall glass till it is half full, the glass loses its power of ringing by a stroke upon its edge, and emits only a disagreeable and a puffy sound. This effect will continue while the wine is filled with bubbles of air, or as long as the effervescence lasts; but when the effervescence begins to subside, the sound becomes clearer and clearer, and the glass rings as usual when the air-bubbles have vanished. If we reproduce the effervescence, by stirring the champagne with a piece of bread, the glass will again cease to ring. The same experiment will succeed with other effervescing fluids.—*Brewster*.

Death of Sir John Leslie.—We regret to announce the death of professor Sir John Leslie, who expired on Saturday afternoon, after a very short illness, at his seat of Coates, in Fife. The death of this distinguished philosopher will create a mighty blank in the scientific world. For original genius, profound literature, and inventive powers, perhaps he had not an equal in modern times. For the long period of twenty-seven years, he filled in succession the chairs of mathematics and natural philosophy in our University; and few brighter names than his occur in its annals. His reputation was equally high in foreign countries as in his own, and his talents had obtained him the most flattering distinctions from almost every scientific society in Europe.—*Edinburgh Advertiser*.

Conveyance of Troops by Railways.—"In cases of emergency, it would be very desirable to send troops by that mode of conveyance, which would be very rapid and safe; in cases not of emergency, it is my opinion that troops should not be conveyed by either coach or carriage, or railroad, but that they should be made to perform one of the most efficient parts of military duty, to march. In cases of emergency, where bodies of military men require to be assembled suddenly, for the public service, on any given spot,—then I should say, that a rapid conveyance is very desirable, and by railroads certainly. I have practised it on the railroad between Liverpool and Manchester with very great effect and benefit to the public service.—*Lieut. General Sir J. W. Gordon.—Min. of Evidence on London and Birmingham Railway Bill.*

Chance of a Second Deluge.—Olbers computed that after a lapse of 83,000 years, a comet will approach the earth to the same proximity as the moon; after 4,000,000 years, it will reach within 7,700 miles; and then, if its attraction equals that of the earth, the waters of the ocean will be elevated 13,000 feet, and cause a second deluge.

INTERIM NOTICES.

The Supplement to the last Volume is now ready; also the volume complete in boards.

We request attention to the letter of our able Correspondent, Mr. Busby, in the present number, as exemplifying the valuable sort of service which intelligent and observant persons have it in their power to render to science, by the communication of every thing of a similar experimental character, which comes under their observation. To lessen the obstacle which the expense of postage opposes to this freedom of communication, we take this opportunity of announcing, that all letters addressed to the Editor, with the words "Steam-vessel Experiment," or "Steam-carriage Experiment," superscribed, will be received at our Office, though the postage is not paid, providing the communication does not exceed a couple of sheets.

Communications received from Mr. Pole—Archimedes—A Plain Citizen—Junius Redivivus—Cargill—Quivis—Mr. Mackinnon—Mr. Downing.

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Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 484.] SATURDAY, NOVEMBER 17, 1832. [Price 3*d*.

DESIGN OF A TOLL-GATE COTTAGE, WITH MACHINERY FOR OPENING THE GATE FROM WITHIN.

Fig. 1.

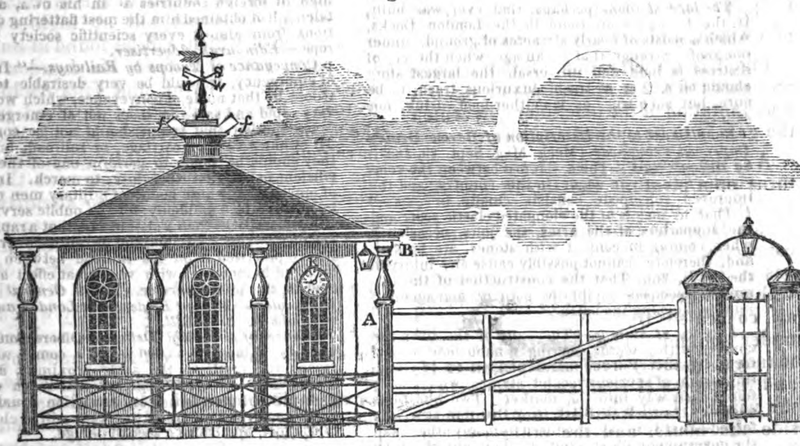
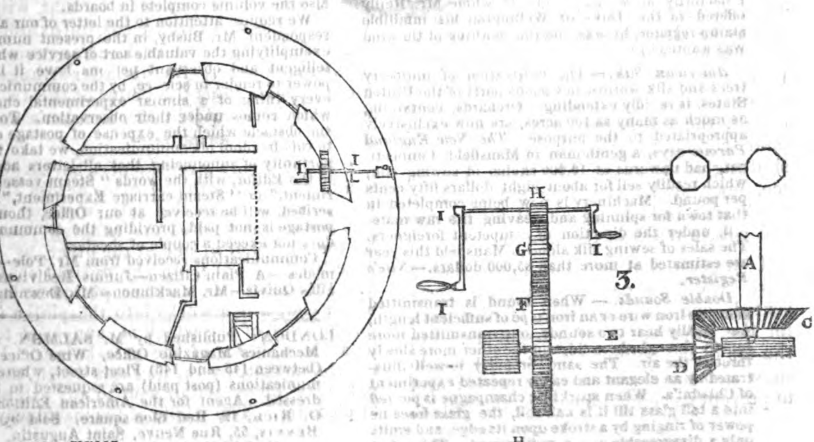


Fig. 2.



DESIGN OF A TOLL-GATE COTTAGE, WITH MACHINERY FOR OPENING THE GATE FROM WITHIN.

Dear Sir,—As several designs have appeared of late in the Mechanics' Magazine of Milestone Cottages, I am induced to send you one of a Toll-gate Cottage, or what some call a Turnpike House, with machinery for obviating the great inconvenience attending the present mode of opening such gates, both by night and by day, but more especially the former. According to this plan, a keeper may, with the greatest ease, open or shut a gate in one minute, without having occasion to step from his threshold or even to leave his bed: he has but to turn the handle of a winch, and the thing is done.

Fig. 1 is an elevation of the cottage and gate; fig. 2 a ground plan; fig. 3 a representation of the machinery, by which the gate is to be opened and shut.

A is the hanging post of the gate: it turns on a pivot at the top B, and the heel of it is inserted in the wheel C. A pinion D works into the wheel C, and is connected by a horizontal shaft E, which passes through the wall of the toll-house with the wheel F; C, D, E, and F being all concealed from sight in a tunnel under ground. The wheel F is commanded by the wheel and pinion G H, and the pinion H is affixed to the axle of the winch I I, one handle of which is inside the house, and the other without. The wheel C should be three feet in diameter, the pinion D one foot, and the wheel F four feet. The wheel G may be of any size, to suit the height at which it may be desirable to have the winch; the pinions on the winch axle should be four inches in diameter. It will be at once seen that, by turning the winch more or less, the toll-keeper will have a complete command over the opening and shutting of the gate. The inside handle, too, may be placed within the reach of the keeper in bed; or at all events the bed within reach of the handle.

I propose that the toll-house should have two illuminated clocks, as represented, one on each side of the gate, for the information of passengers. On the top of the chimney there is a vane, to show also the direction of the wind; and to prevent its being affected by the smoke, there might be two side funnels introduced, as F F.

I remain, dear Sir, yours, &c.,

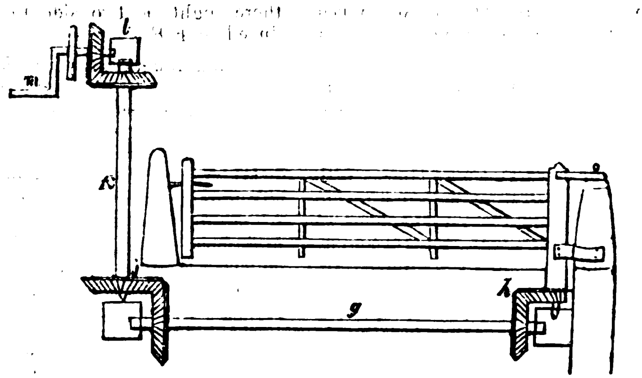
M. SAUL.

Lancaster, 7th September, 1832.

Remarks.

Mr. Saul's ingenious scheme leaves still unrealised two important desiderata, which may be expressed in as many questions:—First, How is the toll to be collected? Second, How is the toll-keeper to be awakened from his sleep, to receive the toll and turn the winch? Perhaps a sufficient answer to the first question may be found in the German method of collecting toll at night, a brief notice of which will be found in our last page, extracted from Mr. Loudon's Enc. of Cottage, Farm, and Villa Architecture; but the difficulty involved in the second, remains yet to be solved. We have generally found in travelling, that the rousing of the toll-keeper was the worst part of the affair; for so attentive are this class of officials to their own ease, that such a thing as a bell is rarely to be met with, or if it exists by order of trustees, it is invariably muffled. Could not some method be invented, by which passengers might pay the toll, and let themselves through, without troubling the toll-keeper at all—on the principle, for example, of the tobacco cannisters, in common use in the parlours of London taverns? We observed in the last number of Mr. Loudon's Encyclopædia, another plan by Mr. Saul for opening gates at night, similar in principle to that with which he has now favoured us, but exhibiting a slight difference in the arrangement of the machinery. As this latter arrangement appears to us the better of the two, we shall here subjoin Mr. Loudon's engraving and description.

"In this figure *g* represents a horizontal shaft, placed in a tunnel made across the road, directly under the gate, working at one end on the heel of the hanging post, by the pinion at *h*, and at the other, by a bevelled pinion at *i*, on the upright shaft *k*. This shaft has another pinion at its upper end, which works into the pinion *l*, on the axle of the winch *m*, supposed to be at the bed-side of the gate-keeper. It is evident that, by turning this winch, the gate may be opened or shut to any extent at pleasure. The whole of the machinery



may be concealed under ground, and in the walls of the house, the winch alone protruding into the bedroom of the keeper."

When speaking of the concealment of such machinery, it ought always to be recollected, that wheels will require oiling from time to time. Both of Mr. Saul's arrangements are attended with a difficulty on this score, which would require to be obviated before either could be of the practical advantage which he anticipates.—Ed. M. M.

THE LORD CHANCELLOR AND THE EDUCATION OF THE WORKING CLASSES.

Le fou qui suit est un pupille, que son tuteur a fait passer pour insensé, dans le dessein de s'emparer, pour toujours, de son bein; et le pauvre garçon a veritablement perdu l'esprit de rage d'etre enfermé.—Le Diable Boiteux.

Mr. Editor,—I have read my Lord Chancellor Brougham's work, "On the Objects, Advantages, and Pleasures of Science," and several other recent productions conceived in the same spirit, and I feel, no doubt in common with other mechanics who may have perused them, the kind and benevolent sentiments they exhibit. Could such living sympathies be made to flow more generally in wealthy and noble blood, learning might perhaps make a poor man wise. But, Mr. Editor, while there is so little of that same fellow-feeling between the rich and the poor, between the great and the little, the day must be pronounced still distant in which indigence may be no bar to the successful pursuit of knowledge. There wants a few Howards to perform the charities of Wisdom; to go into the prisons and charnel-houses of genius, to knock off fetters and to make dry bones live. The search for knowledge creates a thirst, which is, withal, a thirst of the soul, and, like that of the Arab in the desert, can only be quenched for a moment, to feed its own burnings. Would a few solitary springs of benevolence suffice to cheer the million gasping souls, or would it be dried up in a moment? This thirst will continue to increase till it exceed a poor man's means to quench it; and he cannot be satisfied, when he finds his learning useless and unproductive: he will endeavour to raise himself from his lowly sphere; and this endeavour must disorganise the present state of society, if it should be universally successful; for the learned would be the wealthy, the ignorant would be the poor. Is it, then, a wonder that they who are so deeply interested in such a change—the wealthy ignorant—should look with "evil eye" upon any attempts to promote it? A poor man will not *feel* the humility of his station the less, when his knowledge of it is improved. Let him not, then, when the sun of his hope is set, and his vision is obscured by the gathering gloom—let him not be taxed with looking upon the endeavours of others with an "evil eye."

I admit the conclusiveness of Lord Brougham's reasoning with regard to the control of popular feeling by education; but it appears, also, to enclose a fearful sarcasm, doubtless unintended. When a poor man becomes more reasonable, he is less under the sway of his passions: the feelings of the heart, if I may so speak, become feelings of the soul, less easily excited, but more lasting in their duration; not sensual and fleeting, because intellectual and immortal. Such a being is certainly less likely to mix in the "outpourings of popular phrenzy," because, alas! he sees too plainly that they

lead to the sensual degradation he has risen from with so much labour and with so little obligation; he sees too plainly that he must either remain as he is, or by such "outpourings" become worse. His Lordship could hardly have pronounced the curse in more bitter sarcasm.

Lord Brougham appears to be a great advocate for general knowledge. Now knowledge, to be useful, must be particular: there must be a *but*, and he who would pursue a difficult, or even a commonly interesting study, must not be distracted in his pursuit. I think a very good test may be found, in the pursuit of knowledge, to distinguish pleasure, in the confined and delusive sense of the word, from happiness: if it be superficial, it will produce the thousand little springs of vanity, which intoxicate for a moment, and are followed by the dull and sober sadness, the head-aches and the heart-burnings of convicted ignorance; if it be solid, that is, single and undivided, it will exhibit a pure, rich, perennial stream, bestowing, whether in dreams by night or in imaginings by day, that lofty feeling which gives the soul a sure proof of its origin and destiny. I can scarce picture to myself a happier being than he who, with single aim and steady purpose, pursues some chosen study till its difficulties become his toys, and his inventive genius forms them into a new structure, inscribing upon it the indelible characters of his future name. Is the superficial gossiping of what is falsely called general knowledge to be compared with this? And if this same general knowledge be of so little worth, why exhort mechanics to attain it, who have only and barely time for what is useful?

It becomes necessary, then, if a mechanic would derive benefit from his studies, that they should be directed to a subject somewhat abstract or particular. But will he be able to bestow upon it the undivided, undistracted attention required to ensure success? When he arrives at the most interesting and important point, when he may be said to be fluttering with eagerness, and his heart beats as though he beheld a first love, his time of leisure is expired, and he must either neglect his employment, which is life to his body, or dash aside the gay vision, which is life to his soul. But we will even suppose him to have sufficient ability and courage to set aside or resume his studies at will, without pain and without loss: there will yet be a mighty barrier to pass, unconnected with either his moral ability or courage. When he has arrived at the extent of his little library, want spreads a dreary void before him, and he feels its dismal chill, just at the point of time when he has obtained a knowledge of his own ignorance. The book upon which his desires and his studies hinge is valuable and out of reach of his purse—it is scarce, and locked up beyond the reach of his interest. How wistfully he looks upon his labours, useful no more, and therefore no longer interesting, because they cannot be brought to a conclusion! And does his ethereal soul condescend to look wistfully too upon the station of those above him, and upon the glittering ore that might fill up that same dreary void? Oh! how he feels the depth, the keenness of his curse! Who shall pourtray a want like his? Come, ye poets, with your vivid personifications, depict me the poor student's want! Want of interest, want of purse, want of friend, want of hope—to want which is to starve. Enduring all this, is it a wonder if he become listless, neglect his studies, and, in the conflict between his feelings and his reason, find his mental powers prematurely enfeebled? He sinks, perhaps, at length into the indolent sot, or the sullen, misanthropic drudge—of whom instances are not scarce among workmen, as might be testified by those who have had opportunities of observing.

I have written to little purpose, if some of your readers be not convinced that, in certain instances, "a little knowledge is a dangerous thing." To a poor man it produces dissatisfaction with one or all of three things—his ignorance, his occupation, or his poverty. It injures him in the eyes of his fellow-workmen, who are not in general such dolts, but they perceive his little knowledge has been acquired to little purpose; being practical men, they judge him, naturally enough, by their own standard: they pity him; he is their by-word; and if he should rob himself of a portion of his time or the profits of his labour, for the purpose of increasing his little stock, they pronounce him to be under a delusion, and their pity is perhaps exchanged for something worse. I need scarce add, that he is injured in the eyes of his employer by the bad opinion of his fellow-workmen; for the opinions or dicta of a body of men are powerful in a proportion differing but little from that of their numerical strength.

"An inquisitive turn of mind," is commonly said to be "one of the most useful qualities a man can possess." But may a poor man possess it? If he indulge in it, will it not, like other luxuries, be followed by its remorses and its sorrows? The indulgence will perhaps at first only cost him a few pence, and a few hours, spared with trifling difficulty; afterwards,

in the eagerness of the pursuit, his temporary wants are forgotten, should his loss amount even to shillings and days; but should this "inquisitive turn," this luxury, be further indulged, till it become one of the necessaries of life to him, whose necessaries have been, alas! already too numerous, who would envy him his situation? A stoppage in his employment plunges him in miseries, so much greater as they were unexpected—and keener, as they touch his heart and his head at the same time. No man can imagine his sorrows, yet this does not make them less real: his own heart feels them, and a stranger intermeddleth not therewith.

As things are at present constituted in this country, a labouring man will find the time he may employ upon politics as utterly waste. Lord Brougham is a political economist, and naturally attaches importance to the subject of his studies: he believes a certain state of society attainable, and his positions are many of them unsustained, and his arguments useless, because they are founded on that belief. His Lordship must excuse my want of faith: perhaps the cause may be, I have not studied political economy—at any rate, with the rewards he has had in prospect, and the relish he still feels. But it may be necessary I should state the causes of my infidelity. In the first place, men of talent and property have at present all the power in their own hands, and, in my humble opinion, are likely to have in all ages and circumstances of the world. It follows that, while they possess power, any changes effected must be under their control or qualification. Their prejudices, in consequence, will be infused into any measure they may concoct, ostensibly for the public benefit, however wise in appearance, however liberal it may be pronounced. Men of talent will give it a bias towards the privileges of talent; men of property, towards the claims of property; and all the benefit the ignorant poor have to expect must be expected from their mercy, and not from their judgment. Even if judgment have any hand in the matter, the judgment of prejudice must be fallacious; therefore, the injuries they inflict will always have the lame excuse of being unintentional. But it may be said, there will always be a fellow-feeling between the talented rich and the talented poor. I very much doubt this: few are the angels with gilded wings that have condescended to stoop in their flight, to visit the encaged chrysalis, to assist him in loosening his bonds, to teach his fluttering pinions their own free and fearless motion, to establish and enlarge his future hopes by consummating the past. I will, however, waive this, and leave, without further question, the asserted brotherhood of all talented men. Allowing them to weigh equally on both sides of the scale, the point at issue will then be between the ignorant rich and the ignorant poor. How will you reconcile these interests? What political economist will venture to match such extremes? Take, for instance, the sottish employer of a thousand men and his meanest labourer—the brute sea-captain, and his ill-used, hopeless cabin-boy—the sensual West India planter, and his life-whipped-out slave. But it may also be said, the ignorant poor have no right to an equal share of the comforts of life with their richer neighbours; that their wants are very limited; and that, at any rate, to give them a decent stock of knowledge does credit to the judgment and feelings of their benefactors. Now, as to the question of right, between the two classes just named, it must go in favour of the poor ignorant, upon a somewhat old-fashioned, but not less solid argument: their labour produces benefit to society, whereas the rich ignorant have no redeeming quality on which to establish right, unless it be that not inaptly named vested right (that is, a right invested in fine clothes); and as to divine right, if there be such a thing, it must be in the possession of the poor, who are as God made them, implanting natural and moderate desires in them, for no other purpose than to be satisfied. If these desires, then, are limited, and are included in their natural right, how can the rich—how dare they—take any credit to themselves for doling out a little of their own waste and cumbersome comfort? It is about as absurd as if the poor were to take credit to themselves for allowing the rich to possess it.

Then come the noble institutions for the instruction of the poor! The glory of the country!! These are what "make the galled horse wince."

Good men and repenting sinners have died, leaving their offerings of benevolence or contrition to the wants of after generations. These are afterwards applied to any purpose but the intended one; and the poor man is obliged to be grateful for kindness bestowed in vain, and for benefits he never partakes of. His right is acknowledged, yet he never enters on the possession; and his struggles to obtain it only help to make his poverty more hopeless, and his misery more desolate. Thus he feels another curse, not intended for him:—"from him who hath not, shall be taken away even that he hath."

The National Schools, too!—National!

Why should they have a name at all? Abortions, brought forth in the deadly struggle between a nation and her wily oppressors: like the race they spring from, they bear a noble name, but show no image of a noble origin. How well the plan was concocted; how admirably drawn up; how it went on to perfection; from the skilfully-manufactured catechetical *ignorationes elenchorum* of the Church, down to the *syllaba syllabarum* of humble operatives! The system upon which this body of scientific ignorance is spread, is as praiseworthy as the science itself; and the rows of young subjects, with their hands behind them, listening for the word of command, form a picture of future promise which must be gratifying to their benefactors. Sowing in the "young idea" the seeds of non-resistance, and drilling the infant regiments into a habit of glorious obedience, so that the army and peasantry of the next generation may stand to be shot at, or sit to be cajoled, in dutiful submission to the General or Prelate of the day. Their turn is well served by keeping the poor in ignorance: knowledge, in them, would be as injurious to their masters as knowledge in their horses. If he knew his strength, would a man leave his little quiet home, to fight the battles of his ambitious, avaricious fellows—to fill their purses, and emblazon their honours, at the expense of his own toil, and with the tincture of his own blood? It behoves them well to keep a competence beyond his reach; to paint the path of carnage as the path of glory, and to blind him to substantial benefits by darkening his vision with fancied honours. Oh! it was a goodly prospect for them, to see the opportunity of forming out of "the embryo freemen a nation of slaves;" to clip the wings of incipient genii, and cause those to grovel who were born for flight! Go into a national school, ye who have not yet performed that part of your duty, and do another part—make yourselves thoroughly acquainted with its machinery, and the working of it. Why, the very air seems impregnated with the iron of its founders' hearts. There stands the instructor of these *ignorantes*—the foster-parent provided for these orphans of wisdom. Poor soul, or rather poor body, poor machine! He has been wound up; he has learned by rote "to do his duty in that state of life to which it pleased God to call him;" and he is teaching them the same by rote.* Thus they are in a fair way of acquiring the ability to know nothing, and to bear every thing. Perhaps you may visit him after he has, by means of immense labour, brought to a latent state all the fire possessed by the "spirits" in his school: it is cold and lifeless, like its prison of clay; and he passess this off to you as a sign of success, of improvement, of a knowledge of duty, and a wish to be dutiful! Ignorance and apathy he thus calls knowledge and desire: but it is his duty, and perhaps the poor man knows no better. But go again—go unawares: you will perhaps see him, in the vocation of his "state of life," meeting the independent glance of some newly-chained spirit with his *dutiful* look. The child, in his innocent "thirst for knowledge," has asked some question, out of the line of duty, because reaching beyond the bounds of ignorance: for this he is singled out for punishment, for example; and he meets it, as a freeborn child of nature should do, partly with astonishment, and partly with scorn. Compare the red glare of the master with the diamond eye of the scholar, as the former raises his brawny arm in the impotent attempt to quench a living soul. Can you doubt the proof of nobility before you,* or question, for a moment, which is the free, and which the slave? The Spirit of God is said to have brooded upon the face of the waters when a living creation sprang from the darkness and the deep. Methinks I see the Spirit of Oppression brooding over that living creation, to darken what it cannot extinguish, to debase what it cannot destroy.

Is there, think you, any truth in this? If there be, and if your feelings or judgment (I care not which) are moved by it, you will allow me to go farther, and call upon one of you to imagine a child of his own placed in a national school. The idea is debasing, but you must allow it, or cast off all desire to direct your feelings into the path of sympathy, or your judgment into that of truth. You must suppose yourself altered in every respect, except in your domestic affections, and in your love of wisdom; your desires as large, but your means of satisfying them contracted; your prejudices, instead of being those of early education and a life

* Rote. The radical image of this word is a ring or wheel; endless, yet motionless; in motion, yet not progressive; progressive, yet fixed The explanation involves a paradox at every step. Thus the word is admirably adapted to its use, and more expressive than is remarked by superficial readers.

* I know of a noble little fellow, not eight years of age, who was sent to a national school; and after a few days, as his mother was preparing him for school, he said, "Mother, that school is good for nothing: they teach me nothing, and they beat me for nothing; and if you will let me stay at home, I will teach myself." This was repeated to his father, and the boy was taken at his word. He kept it faithfully, diligently, and, with little assistance, advanced rapidly in his studies: he now surpasses, in some respects, his elder brother, who has had greater advantages.

of ease, must be changed for those of youthful ignorance and a life of labour; instead of having been tutored by others as well as by yourself, you have been advanced in knowledge by your own unaided efforts—if I may use a common but expressive distinction, you must imagine yourself an intelligent mechanic, instead of an intelligent gentleman. Your desire for instruction commenced about the same time as the affections of youth began to unfold themselves: you gloried in fancying yourself a free man, enjoying the healthful exercise of your occupation, and the delightful but short snatches of leisure in the pursuit of knowledge. You entered the world of love, of toil, and of wisdom, with a heart for the first, a body for the second, and a soul for the last; you saw the path to distinction before you, and entered upon it with a vigorous emulation; you were told of difficulties, and despised them. You saw beautiful beings around you, and thought it not incompatible that the feelings of nature should be exercised at the same time that the glorious race of mind was run. You made choice of one true heart, into which you might cast your affections without fear of consequences; your wife was a child of toil like yourself, and, like yourself, not in possession of a moment's thought to waste upon those boon companions, idleness and vice. Your mind's increase, and that of your body, ran an almost even race; the produce of your studies was gratifying to yourself, and not without applause from others; your smiling infants sprang around you, and reminded you there were others to instruct as well as yourself—beings all inquisitive to know, and all delighted to feel, their untried existence—whose every smile won you to bestow something of value upon them, and whose eager, inquiring prattle lessened the difficulty in bestowing it.

This was the bright side—this would last perhaps during the first ten or twelve years of your marriage. Then comes the time of trial. Deeper feelings swell when hope sinks; and clouds sometimes hide the sun that should have brightened it, even before he has reached his noon.

You have hitherto instructed your children yourself, but now find you are obliged to devote more time to labour, to supply the increasing wants of your increasing family; and, while your children require additional care in their instruction, you have a diminished stock of leisure to devote to it.* A purchased education is out of the question; and you at length give way to the entreaty of your wife, or some other affectionate friend, and your children,

> " —— pledges o' meikle love
> And wards o' mony a prayer,"

are sent to a National School. I will not say you love one child more than another; but if there be one whose opening talents budded earlier than the rest, and which already begin to spread the fragrance of their promising blossoms, you will naturally feel anxious that the beauty of those blossoms may not be marred, nor their springing life be checked and made to wither. You have paid more attention to this child than the rest, not because you loved him more, but because the others did not require so much at your hands; and you have sometimes thought that if all your hopes of being useful or distinguished should fail, a hope would yet remain of being the father of a more successful son—a son to whom you could give the eye of watchful care you wanted yourself, and whose chance of success was therefore, one degree farther removed from uncertainty. You watch his labours at school, as it is natural you should: you compare his progress with his earlier advances in knowledge. At first you allow yourself to doubt, as long as doubts are reasonable, and not comfortless: but when you see that your child, your hope's image, is being neglected, or tamed, or goaded down, to a certain standard measure of passive ignorance, you shake off doubts that would be now iniquitous, and assume the erect posture of just indignation. Your boy carries the alteration in his very look: that bright, inquisitive eye, which was so often turned up to yours, is now become vacant and almost soulless; that ear, once open to your gentlest admonition, is now stupified by harsh, unmeaning threats; that head, once erect in its innocent, unconscious liberty, is now inclined to the abasing curve of real or pretended submission. His feelings are changed, his desires and pleasures are inverted: they were formerly *to* his lessons, they are now *from* them; fear has assumed the place of hope, and sadness that of joy. When you see the force of habit growing on your boy, and the cowering eye of your soul's darling turned to you too, as if at once to show you what it was become, and to reproach you with having made it so—oh! it would pierce your heart too much! I do not know the enemy I would curse with such a look from his child.

Nor is this all: the air of the school, the collected breath of some hundred beings, the cramped posture, the inaction

* The tax upon your philosophy, in giving up private study, is but a secondary consideration: the feelings of a father may fairly outvalue that, dear as it is.

the dullness, the noise, and yet the constrained silence, all contribute to undermine the health of your child. He was once equally free at his play and at his lessons, bearing the constant, cheerful countenance of health at both: he is now wan, listless, and unnaturally sad; the sigh, prophetic of consumption—the flickering eye, the pale cheek, the red lip, speak in gradual but assuring demonstration of what the body is undergoing. It becomes even somewhat dangerous to allow him at all, opportunities to be in the air, so that he is obliged to be denied his usual share of recreation. I need not dilate upon the consequence: you perceive the lesser evil, and withdraw the suffering innocent, with a feeling conviction, and a minutely accurate knowledge, of the benefit of those glorious institutions of the country, National Schools!

But I fear, Mr. Editor, you will think this digression already sufficiently tiresome. I therefore hasten back to consider what are the "substantial advantages" held forth as belonging to popular education. Among these I find "Poetry and Gardening." I must admit that so far as regards a healthy state, mental and bodily, these are the most useful ministers to a poor man in the whole catalogue. Health of body and health of mind are universally acknowledged to be the chief blessings of this life; and, were this acknowledgment accompanied with consistent practice by mankind individually, codes and pharmacopœias would be of little use. It is delightful to behold the beauties of a well-stocked garden: it is delight, and health, and instruction, to be employed in one—to watch the beauties as they open, or to cull their produce as they fade; to cherish their vigour while they grow, and to read their moral when they die. And what gardening is to the body and its feelings, poetry is to the soul and its faculties: he who reads as he runs, catching a glance of some fine frenzied eye in its passage "from heaven to earth," will find himself raised and refined by it; but he whose life is poetry, and whose poetry is only a copy of his gentle life, breathing the morality of love, and feasting upon the images of purity, walking in the path of goodness, and resting in the light of truth,—such a one, in verity a poet, enjoys a constant flow of youthful vigour, and a rich stream of mental health, that seems to look for no decay. But how has it been? When the peasant-poet has attracted the notice of "fashion and fortune," they have drawn him from his dream of heaven to curse him with earthly realities; they have given him a vitiated taste, and a relish for unhallowed fruit, and then left him to perish in view of his new paradise!

A workman's world is very much like other people's worlds; and an intelligent mechanic constantly sees men of inferior abilities advanced before him by arts, insidious and persevering, which he disdains to practise. If his employer be benevolent he is misled, if he be intelligent he is hoodwinked, by those who are adepts in a science which is their sole study: if the master be neither intelligent nor benevolent, he joins in the common cry, that a studious workman is good for nothing, and all clever mechanics are given to drinking. So much for "sagacity and understanding!" The self-satisfaction and pleasure which some optimists speak of, seem to be the only benefits obtained by a workman "ranging into subjects unconnected with his trade."

Let me not, Mr. Editor, be set down as a moody desperate being, who beholds every thing on the dark side. The hope still remains, though a very distant one, of a coming time, when nobility of thought, the life-stream of the soul, will be universally acknowledged to be superior to nobility of blood; when the opportunities of gaining knowledge, and of applying it, which is the born-right of all men, will be no longer withheld from the poor; and when the gifts of nature will no more perish for lack of use, to the perpetual loss of their possessors and of mankind. Nor let it be imagined that my wish is to see levelled all the heights and depths of the political world, to dissipate all the *homines bullæ* of the ocean of life. Let them bubble on. I would only ask for every man a fair station and equal favour; and it may be appropriately asked, in the words of the ancient mathematician, with some trifling alteration; Δὸς πόυ στῶ, αλλ' ου θέλω τὴν γῆν κινεῖν.

Mr. Editor, I am your obedient servant,
Sam. Downing, Cabinet-maker.

IMPROVED METHOD OF USING WHEEL-DRAGS.

Sir,—Passing down Ludgate-hill the other evening, I noticed a very heavily laden west-country waggon, going down the hill with one of the wheels locked; the consequence of which was, that the friction of the wheel upon the stones caused the evolution of considerable heat, which dried up the road in the track of the wheel, and at length produced a charring of the fellies, as was shown by the escape of small quantities of smoke accompanied with a strong smell of burn-

ing wood. On reaching the bottom of the hill, I went up to the waggon, and found that it was furnished with a proper shoe or drag, but that the driver chose to *lock* the wheel in preference to using the drag. The reason appeared to be, that the former was the *easier* method; for if the shoe had been used, it would have been necessary to *back* the waggon out of it, whereas the locking-chain was disengaged in an instant, by simply striking off a ring.

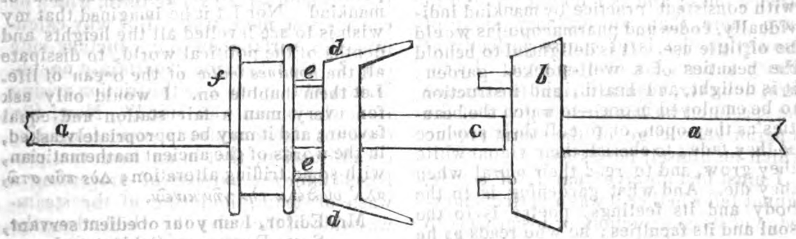
Few persons are perhaps aware of the extent to which wheels are continually injured by this practice; first, by the actual wear of the iron tire; and, secondly, by the mischievous effects of the heat upon the wooden fellies. I have repeatedly observed on Ludgate and Holborn-hills, and other places, both in town and country, that unfortunately this is a regular practice, partly arising from laziness, and in part from the real difficulty of backing a loaded vehicle out of the drag.

It has, therefore, occurred to me, that a very simple remedy may be provided for this evil, by rendering the use of the shoe *as convenient* as the locking-chain. And this may be done in several ways: thus, for instance, by using a drag-chain of such a length as to permit the wheel to roll off it, and to take it up short enough to carry the wheel, when it is to be dragged, by the same simple fastening at present used for the locking chain; viz., a ring sliding on a bent pin. In this way the drag may be used, and when the vehicle reaches the bottom of the hill it may be instantly and easily disengaged, and, when the wheel has rolled off, may be hooked up out of the way. Or the shoe may be permanently fixed by a chain behind the wheel, and connected with the drag-chain, when required, in the way before-mentioned; when done with, it may be disengaged from the drag-chain, and replaced behind the wheel.

I am, Sir, your's respectfully,

W. Baddeley.

FRICTION CLUTCH-BOX FOR ADJUSTING THE CONNECTION BETWEEN A CONSTANT-GOING WHEEL AND INTERMITTING MACHINERY.



Mr. Editor,—Some years since machinery was put up in a building adjoining a mill which often wanted going and stopping. Being driven by wheels with teeth, it was necessary, to prevent a fracture, that the water-wheel should be stopped. As this was found very inconvenient, after some thought, the following method was tried, and has answered ever since. Apprehending it might be useful in many cases, I take the liberty to request the insertion of this description of it in your Magazine. The machinery alluded to was driven by an iron square bar, and the improvement consisted in the introduction of a connector, which, in the absence of a better name, I shall call a friction clutch-box, which is different from any thing I have hitherto seen. The one-half of this box, with two studs, is fixed, as usual, at one end of the shaft to be connected, and the outer circumference is bevelled about $\frac{1}{8}$ of an inch in an inch long, forming part of a cone; and the other half of the box has a broad hoop fixed thereon, and standing forward like a cup, which, when pushed forward on the cone, gradually produces friction sufficient to set the machine a-going; and then there are two bolts previously drawn back which are made to slide through this latter half box, and

lay hold of the studs. The improvement will, however, be made clearer by reference to the prefixed sketch.

aa represents the bar cut in two at *c*; *b* the fixed half of the box, with the two studs fixed, and fixed on shaft; *dd* the other half of the box with hoop; *ee* two bolts fixed into *f*, and made to slide through *d*, far enough to grasp the studs in *b*.

As here represented, the bolts are withdrawn and out of work. Care must be taken that *f* with the bolts are not forced forward, until the motion is gained by pushing *d* on the cone.

N.B.—*dd* may have a groove as well as *f*, to put the lever into force backward and forward; and the end of the two bolts should be riveted enough to prevent their being withdrawn out of *d*; but they should be drawn back flush when disengaged.

W. S. S.

RONTREE'S STEAM VALVES.

Sir,—In reply to Mr. Rontree (last vol. p. 234), I beg to say, that so far from being actuated by prejudice, I should feel more pleasure in noticing one real improvement, than in commenting on twenty fancied ones; and as I do not pretend to have more than an ordinary share of knowledge, he is of course perfectly at liberty to form his own opinion. In return, however, I claim a right to examine the specimen he has already given of the superior knowledge of the steam-engine which he himself possesses.

I must first observe that I, of course, cannot tell whether it was a perfect knowledge of its construction, or his anxiety to prove at once both the superiority of his invention, and the groundlessness of my assertion, that induced him to draw his plan of the four-way cock, fig 1, p. 234, more than twice the diameter required by the size of the passages therein shown, and at the same time made him call fig. 2, an elongated view of his valve, when it certainly does not show one-half of it; and I still remain so short-sighted as to be unable to discern in what his valve differs, as he says, so materially from the cock in construction and principle, but more particularly in action.

1st.—For construction, he bores out the ends of his cylinder somewhat conical, as he of course would the outer part of a cock; the ring or hoop must then be turned to fit, and be ground in the same way as the cock plug; it likewise requires to be kept in its situation by the application of a mechanical force.

2nd.—The action of his metallic ring is a circular reciprocating one; that of the cock is precisely the same; and his only argument (if so it may be called) in proof of the difference of action, is, that his valve does not require to move through so great a space; but he will, of course, allow that both must move sufficient to open and close the passages.

Having thus shown that both the construction and the action of Mr. R.'s improved valve are so exactly like that of the cock, he will perhaps, take the trouble to point out more explicitly the difference in principle.

Mr. R. says—"It will also appear that one-third of the surface between the ports never comes into contact with them." But surely he does not mean to say there is less friction on that account, or that all his ports are not opened and closed just as often as the passages of a cock for every revolution made by the crank shaft. He then states, that the necessary surface of his valves, on the eduction side alone, must exceed the whole surface of the common slide by one-third, which he considers a mere trifle. But why calculate the surface on the eduction side only? Oh! because "certainly no objection will be made to the friction arising from the steam-way side!" Now, Sir, does not this amount to something like an affirmation, that in an invention professedly for the purpose of preventing a waste of steam, the fitting of the steam-way side of the valve (by which alone the steam can be prevented from flowing continually into the condenser), is of no consequence, or in fact that the face of that side of the valve does not move in contact with the cylinder; for what else can do away with the friction of that half of the hoop? And however my ideas may square in his estimation, this, as well as the absurdity he names, will, on reference to his original plan, be found to be entirely his own. Perhaps he will take an early opportunity of favouring us with some account of the advantages he expects to derive by making the metallic ring double, as shown in the same plan.

I now come to that sentence wherein he concludes, by enumerating all the ad-

vantages possessed by his invention:— 1st, Is the saving of steam, which I have already discussed. 2nd, The property of keeping the cylinder at all times clear of water; this I shall presently consider, together with the objections to the old method, contained in his former letter. 3rd, "The means afforded of increasing the eduction," for which I cannot see the least occasion, as the passage that is large enough to fill the cylinder in a given time, when opposed by a considerable resistance, must surely be sufficient to empty it in the same time, when all resistance is removed. 4th, "The introduction of the steam in a sheet, rather than through one contracted orifice." This may accord with his theory, but in practice (if it could possibly make any difference with so rare and subtle a fluid) it must be in favour of the one orifice, provided it is equal in area to the many.

With respect to the objections he has made to the short-slide, (Mech. Mag., 25th Feb. 1832,) the waste of steam he takes to be a matter of much greater importance than I do; and the steam-ways I consider to be large enough for the eduction, and therefore believe his fears on that head to be groundless. With regard to the water produced by condensation, I will suppose with him that some portion may find its way into the cylinder (note that the quantity will in a great measure depend on the relative situation of the boiler with that of the cylinder) while he is getting up the steam; but with all condensing engines it is common to blow through before starting, which in my opinion removes much of the evil, and the little that remains cannot continue long after the engine is at work. The very reason he has given for its continuance throughout the working of the machine, must effect its speedy removal. He says, the steam on entering the cylinder will be condensed by coming in contact with the said water. Agreed; but then the condensation of steam is attended with a certain loss of caloric, which will be transferred to the matter causing such condensation, viz. the aforesaid water, thereby raising its temperature until it can remain as water no longer, and of course will be entirely got rid of by being converted into steam.

I remain, Sir, yours respectfully,

TREBOR VALENTINE.

Derby, Sept. 25, 1832.

THE COMET—CHOLERA—AND EDUCATION IN AMERICA.

Sir,—I cannot heartily subscribe to Mr. Herapath's doctrine, quoted in the Mechanics' Magazine from the *Times*, that the comet of 1831 was the cause of the cholera morbus. It should be recollected, that the disease has now prevailed for some years in the East, so that at any rate it must have been originally stirred up by a comet, much older than that of last year. But have these heavenly visitors in reality any thing to do with the excitement of pestilence? If such were the case, it seems plain enough that 1666 (the year of the great plague) would have seen "the great comet," rather than the undistinguished year 1680, and that 1811 would have been far more unhealthy than 1831. The truth seems to be, that these eccentric luminaries are by no means so unfriendly as we are too often inclined to think them: witness, for one thing, gentle reader, thy cool perusal of this epistle, so many days *after* the dreaded 29th of October!

You call for facts, to throw light upon the conflicting statements as to the progress of education in the United States: perhaps, therefore, the following extract from "Sketches of the Valley of the Mississippi," by Mr. Timothy Flint, a Yankee bred and born, and by no means inclined to underrate Transatlantic pretensions, may be found worth the copying:—

"America inherits, I believe, from England, a taste for puffing; but she has improved upon her model. A little subscription school, in which *half the pupils are Abecedarians*, is a COLLEGE. One is a Lancasterian, or a school of 'instruction mutuelle.' There is the Pestalozzian *establishment*, with its appropriate emblazoning. There is the agricultural school, the missionary school, the *grammar box*, the new way to make a wit of a dunce, in six lessons, and all the mechanical ways of inoculating children with learning, that they may not endure the pain of getting it in the old natural way. I would not have you smile exclusively at the people of the west. This ridiculous species of swindling is *making as much progress in New England as here*."

It is true that *Old* England is by no means free from this sort of educational humbug; but it appears sufficiently plain that Brother Jonathan beats us on that

score, "all to immortal smash." We have got no such *colleges* as Mr. Flint describes *yet*.

I remain, Sir, yours truly,

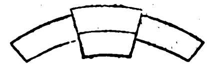
F. H.

November 2, 1832.

MODE OF BUILDING A DOME WITHOUT CENTERING.

Sir,—I was glad to see the communication of "A Country Gentleman" in your Magazine (p. 56), because such an inquiring spirit as your correspondent manifests, gives promise of a kindly feeling that may quicken and spread among the class to which he belongs, when it shall be found that those of that class who desire practical knowledge emerge from the folds of their seclusion, and seek it where it is most likely to be met with—among practical men. I was also gratified to prove the truth of my constant belief, that many gentlemen neglect inquiry at home, not from a lack of patriotic spirit, but from a notion that the required information can only be obtained abroad—being often struck by some apparent novelty, without being aware that it had grown stale in their native land.

I believe the method of building a dome without centering has been known to English mechanics for a time longer gone by than can be traced with certainty. In fact, the process is so simple, that, although it might not have struck a theorist so immediately, a practical man could hardly have proceeded far in his work without being led into it. We will suppose such a practical man commencing a dome without any knowledge of the proper method to be pursued. He lays the first course of material at the spring of his intended dome, inclining a little inwards; he follows with a few more courses until he finds their inclination become too great to allow them support; he then, very naturally, endeavours to make his blocks *support themselves*; he tries various methods of accomplishing this, and cannot be long in hitting upon the best, from its very simplicity. Mere accident, perhaps, gives him the first idea of it; one block being left below the regular course, he will find another block upon this, supported by the ends of the two adjoining and more elevated ones, in the manner here represented:—



this will lead him to the more uniform and "solid" method of raising alternate courses, each block half its thickness higher than its neighbour: he thus will find he can build his dome up to its summit without centering.

For the purpose of showing this practically I have made a model of a dome about 3½ inches diameter, formed of upwards of 150 pieces, which your correspondent may inspect if he will name a place to which it may be sent.

Yours, &c. SAMUEL DOWNING.

8, Aldersgate-buildings, Nov. 5, 1832.

PROGRESS OF STEAM-TRAVELLING ON COMMON ROADS.

Sir,—The other day I was accidentally a witness of the misfortunes of a most unlucky member of the donkey tribe: he was plodding quietly along, when, on a sudden, he seemed to be taken most unaccountably with a desire to "show his paces," and, with a ridiculous attempt at a lively caper, ran his head bump against a post. Half-stunned by the concussion, he was only "roused to a sense of his situation" by a series of hearty thwacks on his "nether parts uncourtly" from the hand of the costermonger, his master, who accompanied each thump with some such stentorian exclamation as, "You stupid ass! can't you see where you're a-going to?—You must kick up your heels, must you? but (thwack, thwack,) I'll make you remember it!"

Now, really, Mr. Editor, without meaning any thing at all personal, I could not read the letter of your correspondent "Animo," on steam-carriages, without having this clever speech of the costermonger brought fresh to my mind. Without, of course, meaning any thing at all offensive, I must be permitted to remark, that the parallel between the situation of this "civil and temperate" remonstrant and that of *the ass*, is very remarkable.

What is he driving at? He does not attempt to say that the "Note worth Notice," which has put him in such a fluster, contains any thing but fact. He cannot deny, what is so apparent that

he who runs may read; *i. e.* that steam-locomotion has not made a twentieth part of the progress that was anticipated a year or two ago: and he could not have denied, if it had been asserted, that there has been a great deal of mere quackery and humbug afloat on the subject, on the part of some of those concerned. It is now pretty plain that the House of Commons need not have been in quite so great a hurry to prepare for the general introduction of steam-travelling: they might have waited another Session or two, at least, if not longer, and most probably, with some advantage. From the tenor of their Report, it may be gathered that they must be among the number of those who are "astonished" at the "tardiness" of the progress of steam-locomotion; for they would hardly have been in such haste to provide what tolls should be paid by steam-propelled vehicles, if they had thought that, up to the end of 1832, the only machines of the kind in existence would be a few merely experimental ones.

"Animo" is, withal, rather inconsistent. He observes that the newspapers have, "as might be expected," been imposed upon by false statements, "which, in such fugitive publications, may well be excused;" but yet complains that the pages of the Mechanics' Magazine have not been more fully occupied with the subject: in other words, that the "false statements" have not appeared there; for, as to the "naked facts" which Animo pretends to thirst for, they have been given pretty copiously in the last two volumes,—to which he would do well to apply himself. As to his Jeremiads about the "general apathy," they deserve no attention. A projector must expect to meet with difficulties; but a really practicable scheme, presenting a fair prospect of profit, would not have long to wait for supporters in this enlightened age, although capitalists, like other people, are naturally suspicious, and wait to see something *done* before they venture their money. Unfortunately, there has been so much *puff* about the professions of some, at least, of our steam-carriage inventors, that this suspicion is increased tenfold.

So much for Animo. Mr. Vere is another guess-sort of man. Never, surely, was any person so tenderly careful of another's reputation as Mr. V. is of Mr. Walter Hancock's. The slightest approbation of Mr. Gurney seems to be "gall and wormwood" to his Pylades-like friendship. Can it be possible that he has any thing to do with Mr. H.'s concerns,—that he is at all interested in the success of that gentleman's separating boiler,—or has the golden age really returned? It would be rather difficult, by-the-bye, to discover on what ground Mr. Vere conceived the unfortunate "Note worth Notice" to "invite reply;"—at any rate, he makes no reply to it,

F. H.

5th November, 1832.

NEW PUBLICATIONS CONNECTED WITH THE ARTS AND SCIENCES.

A Memoir on Suspension Bridges, comprising the History of their Origin and Progress, and of their Application to Civil and Military Purposes, &c. By CHARLES STEWART DREWRY, *Associate Member of the Institution of Civil Engineers.* 211 pp. 8vo., *with numerous plates.*—Longman and Co.

Considering how much suspension bridges have come into vogue during the last fifteen years, and to what an extent the details of their construction have engaged the attention of ingenious and scientific men, it is rather remarkable that nobody before now, should have thought of embodying the great mass of information which lay scattered about, respecting the theory and practice of this interesting branch of practical mechanics. There was, doubtless, as Mr. Drewry observes, "a blank thus left in professional literature;" and it is creditable to his sagacity that he should have selected so clear and yet fertile a field for this his first appearance (we believe) as a scientific writer.

Mr. Drewry begins by presenting us with historical and descriptive notices of all the more remarkable bridges erected on the suspension principle, from the early rope bridges of South America and the East Indies, to the magnificent iron structures of the Telfords and Browns of our own country and times. We have next designs of various bridges, which are in the course of erection, or proposed to be erected—such as the Clifton, Marlow, Montrose, &c. Mr. Drewry then relates the numerous experiments which have been made to determine the strength and durability of the various materials used in suspension bridges, the kinds

up with an examination of the theory of their construction, and a series of practical deductions for the guidance of persons who may engage in works of this description.

A considerable portion of the work consists of necessity of mere compilation; but it is such compilation as lays claim to no inconsiderable share of praise. It is clear, succinct, judicious, accurate, and comprehensive. We are not quite satisfied that Mr. Drewry has carried his historical researches far enough, but we miss nothing of sufficient importance to induce us to go to the labour of tracking his footsteps. The matters in which we suspect him to be most deficient, are the rope suspension bridges of the East Indies, and those temporary constructions comprehended under the general title of Military Bridges. We see no mention made of the Shakespearian bridges, constructed of coir rope, now common in the East, and so named after their modern inventor; or of the barrel-bridges of Colonel Pasley, which, if we are not misinformed, have been proved by trial to have considerable advantages, both in point of facility and security, over those on the old plan.

Of that part of the work which is more strictly original, the part, namely, in which the theory of suspension bridges is considered, and practical rules laid down for their construction, Mr. Drewry observes:—

"The method which he has pursued in forming the rules, has been to establish some mode of calculation on the groundwork of experiments, and on the received principles of the strength of materials; and then to modify the formula so constructed, until its results would correspond tolerably with the proportions adopted in practice in the best existing examples of suspension bridges. This method is not perhaps the most scientific, but it is sufficient for practical purposes, because the object of rules, in practical construction, is to find results for new cases, proportionate to those that time has stamped as sufficient in previous practice. Experience, therefore, alone can determine how far the rules given are efficient; and if, upon trial, they are found to be so, the object of the Author will be attained."—*Preface.*

We are inclined to think that this method, which Mr. Drewry admits to be "not the most scientific" which could be adopted, yet holds to be "sufficient for practical purposes," is just no method at all. What use or method is there in deducing from well-established facts formulæ to regulate practice, and then trimming, or as Mr. D. calls it, modifying, these formulæ until they "correspond tolerably with the proportions (already) adopted in practice?" Of what utility can rules be in any case, if the practice which they are to regulate—no matter how erroneous or absurd that practice may be—is to give the complexion to the rules? Mr. D. gives up the whole question, when he tells us that "experience alone can determine how far the rules given are efficient." Experience then, according to Mr. D., is the only guide; and all the rules which he has deduced from "principles," with all the algebraic drapery in which he has chosen to envelope them, are of no use whatever. Would it not have been better had Mr. D. contented himself with stating simply the results which experience has furnished? We doubt not that individuals would have, ere long, been found of capacity sufficient to reconcile these results to the principles of mechanics.

The rules of Mr. Drewry, though, according to his own showing, only to be judged of like quack medicines—by their results, come after all wonderfully near what we should suppose to be the real truth; and as it is the practice, in constructions of the class of suspension bridges, to make unusually large allowances for errors and contingencies, we make no doubt they will be found to answer very well for all ordinary purposes.

It is a common fault of writers to exaggerate the merits of whatever pet theme they take in hand; or, as our homely English adage has it, to represent all their geese as swans. From this Mr. Drewry is very laudably free. Suspension bridges are not with him the best of all possible bridges, because he has written a book upon them. He points out very fairly how their utility is limited by different considerations; and is content to be able to recommend them, within certain limits, as deserving of public preference. We have great pleasure in extracting the following very judicious remarks on this head:—

"The prominent quality of a suspension bridge is its independence of the bed of the river that it crosses. Hence, it can be thrown across an opening where it is

impracticable, either from rapid current or from the altitude of the banks, to erect centering for a stone bridge. Its next most valuable qualities are the facility and expedition with which it can be built, and the consequent economy. These advantages, added to the elegant lightness of suspension bridges, have combined to throw a degree of charm about them, which is, perhaps, becoming exaggerated, and may lead to their adoption in unfitting situations. It should be remembered, that, while suspension bridges are built on the proportions hitherto adopted, even in the strongest, they are incomparably lighter than stone or cast-iron arch bridges. There is no suspension bridge in existence that would be fit to bear permanently the load that is daily and hourly crowded on London-bridge. A bridge destined to be a great and perpetual thoroughfare, exposed not only to be frequently quite filled with people, and to the passage of troops, but also to the rapid motion of great numbers of heavy vehicles,—in fine, a bridge in a busy part of a great city—ought not to be on the suspension principle. For, if it were made no stronger than our strongest suspension bridges, it would not possess sufficient stability. If, on the other hand, the strength were increased to a sufficient extent to enable it to bear safely its constant work, the weight, the difficulty of getting up the chains, and the increase in the masonry part, would so raise the expense, that it is doubtful how far it could be brought under that of a stone or cast-iron bridge. Add to which, a suspension bridge would never equal in stability a common arch bridge, because it is subject to vibrations, the law of which is not sufficiently known to calculate their precise results in practice, but which certainly are more dangerous in a heavy bridge than in a light one. The object, therefore, in building a suspension bridge, is either to make it so light that its own vibration shall not hurt it; or if, as in nine cases out of ten, that cannot be done, then to make it so heavy and stiff, in proportion to the load it will have to carry, that the load shall not cause it to vibrate much. This, for a bridge liable to be constantly loaded with as much as it could contain, would be impracticable.

"For large openings, where it is of importance to have a permanent passage, and yet where the number of passengers is seldom great at a time, suspension bridges are admirably fitted, because they can be carried to almost any span, and any height, for a comparatively moderate expense. There are also multitudes of situations where it has been usual to build arch bridges of stone at great expense, and where the traffic is not at all beyond the measure of strength that may judiciously be given to a suspension bridge.

"For military bridges they are well fitted. The chains or cables, the platform, and even timbers, ready prepared to form suspension piers, — an entire suspension bridge, in fact, might be carried more conveniently than a pontoon bridge, and could be rigged up for use in very little time. They would also be peculiarly well adapted for crossing chasms in mountainous countries. On the Simplon and St. Gothard roads, for instance—the celebrated passes from Switzerland to Italy—the chasms that have to be crossed by bridges are frequently many hundred feet in depth, although not broad, and the faces of the rock so perpendicular or overhanging as to give hardly any means of erecting centering for an arch bridge. The expense, consequently, of making them must have been very great. A suspension bridge, moreover, as a great military pass, would give the inhabitants greater command over it; for, by knocking out a few connecting bolts, a whole bridge might be dismantled very rapidly, without being destroyed, to check or retard the enemy's passage; whereas, to cut off the passage of a stone bridge, it must be blown up, and cannot be renewed but with great expense and loss of time.

"For piers or jetties on the sea-coast they appear to be peculiarly adapted, from the openness of their construction. If the suspension towers are founded on piles, and themselves made of strong but open frame-work, and if the chains and platform are properly combined, to get as much stiffness with as little weight as possible, so that they may resist vibration without being so heavy as to be endangered by the vibration they cannot resist, a suspension pier may be buried in the waves without being hurt." pp. 208—211.

We take our leave of Mr. Drewry with very favourable impressions, on the whole, of his talents; and hope that nothing we have said will tend to damp his ardour in the pursuit of a profession to which he brings such important qualifications, as the habits of industrious research and patient scrutiny evinced in every page of his work.

The Cabinet Annual Register, and Historical, Political, Biographical, and Miscellaneous Chronicle of 1832, is announced for publication on the first of February next, with additional claims to public favour and patronage.

MISCELLANEOUS.

Newton's Opinion of the Age of the World.—"He appeared also to be very clearly of opinion, that the inhabitants of this world were of a short date, and alleged as one reason for that opinion, that all arts, as letters, ships, printing, needles, &c., were discovered within the memory of history, which could not have happened if the world had been eternal."—*Conduitt's Narrative.*

Opening Toll-gates at Night.—We hope the time is not far distant, when the occupiers of mansions whose approach roads are guarded by entrance lodges and gates, will so far study the comforts of their gate-keepers as to introduce this piece of mechanism (a gate to open by machinery), or something better, to prevent the necessity of their getting out of bed to open the gate in the night time. In Germany the toll-bar or beam (schlagbaum) is balanced by a weight at one end, and the other is held down by a cord, which passes under one pulley and over another, into the bed-room of the gate-keeper, who, without rising from his bed, pushes out through a small opening a long-handled iron ladle, in which he receives the toll, and afterwards untying the cord the weight raises the bar, and the traveller passes through.—*Loudon's Ency. of Cottage, Farm, and Villa Architecture, Part VI.*

The Electric Eel is sometimes sent to England in tubs, when the wood and iron act as conductors, and keep the fish in a continued state of exhaustion, causing eventually death. An earthenware jar is the vessel in which to keep it in health. —*Journal of the Geographical Society.*

Purification of Oil.—We observe an announcement in one of the Daily Papers, that a person has discovered a method of extracting the colour from oil—of rendering it, to use his own words, "as colourless and clear as spring water, in which state it will remain durably." If so, the Fine Arts will be specially and everlastingly indebted to him.

Iron Boats—Expedition to the Niger.—Extract of a letter from Mr. Richard Lander, dated Isle de Loz, Coast of Africa, Sept. 6, 1832, on board the Quorra Steamer:—"I write merely to inform you, we arrived here on the 3d instant, all well, and leave for Cape Coast this evening. All the vessels have behaved very well. We have had several tornadoes; the lightning was felt more on board the Quorra than the iron steamer; it remained on our decks, but it merely struck the sides of the latter, and glided off into the water. This will give you an idea that an iron vessel is even safer than one built of wood. On board the Quorra we suffer much from the smell of bilge water, while the iron boat has not made one inch of water since she sailed from Liverpool, and she is never warmer than the water she floats in."

Great Canal of Goetha.—This magnificent waterline, which passes through the heart of Sweden, and unites the North Sea and the Baltic, was opened with great solemnities on the 26th of September last. It will admit vessels drawing nine feet and a half water, and two and twenty feet in width; and they may make the passage into the Baltic in eight days, with the aid of steam-boats across the lakes which occur on its line. It has been two-and-twenty years in construction, and cost rather more than 10,430,000 dollars (1,285,000*l.*), of which 6,378,334 dollars were contributed by the state.—*Athenæum.*

A New Material of Building has been employed in a wall which Mr. W. Ranger is now erecting for Mr. Lawrence Peel, behind that gentleman's mansion in Kemp Town, that will, without doubt, come into general use, and probably in the end supersede brick throughout the country. In appearance, it has all the nobleness of stone, and its durability is equal, while its cost is in the proportion of only one to three. The principal ingredient is the grey lime of our own Downs, which is manufactured into a concrete mass. It is impervious to wet, so that houses built of this material must, of course, be warmer than at present; and it has this further advantage, that it can not only be moulded into stones of any shape or size, but may even be worked up on the spot, so as to form one solid unbroken mass.—*Brighton Gazette.*

New Church Clock, Haslingden.—The clock which now adorns, with its four conspicuous dials, the handsome tower recently erected to the church at Haslingden, has been, within the last fortnight, to the indescribable delight of the inhabitants of that town and neighbourhood, put into full motion. In addition to the four principal dials alluded to, it operates on three others, which, although of minor, are not of inconsiderable importance; namely, one in the room in which the works are placed, and in immediate connexion with them, for the general regulation of time; another in the belfry, for the direction of the ringers; and a third in the interior of the church, in view of the congregation. The quarter chimes are given, with significant repetitions, on four bells, selected and arranged so as to produce the most musical and interesting series of sounds; and the hour is struck, in a perfect chord, on the same number,—a contrivance in this clock said to be unique, and by which its announcements of time are rendered so sonorous as to be distinctly audible to the distance of several miles. This magnificent piece of mechanism, on which scarcely any encomiums could be extravagant, having been pronounced by competent judges, for simplicity of design, excellence of materials, elegance of structure, and exquisiteness of workmanship, not to be exceeded, reflects the highest credit on the skill of the maker, Mr. Titus Bancroft, of Sowerby Bridge, near Halifax, and not less on the liberality of the purchasers, the inhabitants of Haslingden, by whose voluntary contributions the whole cost, amounting to upwards of 300*l.*, has been defrayed.—*Lancaster Gazette.*

INTERIM NOTICES.

The length of Mr. Downing's letter on Lord Brougham's work on "The Objects, Advantages, and Pleasures of Science," has left us no room this week for several communications which can ill bear postponement; but we are sure no one will quarrel with us on the point of precedence who estimates as we do this very remarkable production. Favoured though we have been with innumerable proofs of the intellectual attainments and capabilities of the class of journeymen mechanics, we confess that it was with a degree of surprise, amounting almost to incredulity, that we saw the addition of "Cabinet-maker" annexed to the name of the author of a paper, which, for originality of thought, beauty and force of language, and brilliancy of illustration, yields to nothing which has appeared within our recollection on the subject of which it treats.

We feel obliged to M. for his valuable paper, and shall send to him, in a few days, a translation of the Appendix for his approval.

Communications received from A Country Member of the Society—A Friend of the late Mr. Taylor —A Sportsman—H. Turner and S. Seare—Saxula—Mr. Baddeley—Junius Redivivus—T. M. B.—Mr. Owen Smith—W. D. (who shall hear from us soon) —J. H. B.—A Subscriber to the London and Birmingham Railway.

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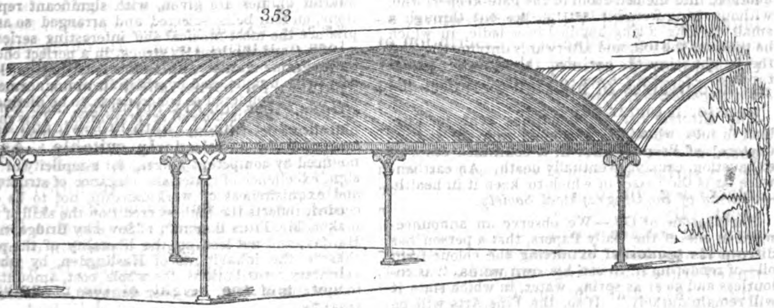
No. 485.] SATURDAY, NOVEMBER 24, 1832. [Price 3*d.*

THE CORRUGATED IRON-ROOFS AND GATES OF THE LONDON DOCKS.

353



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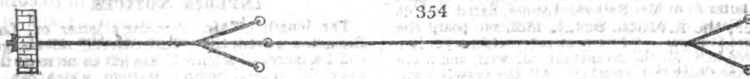

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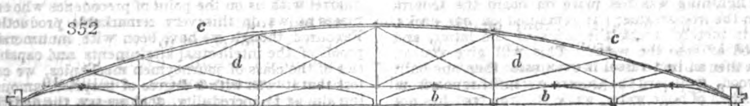

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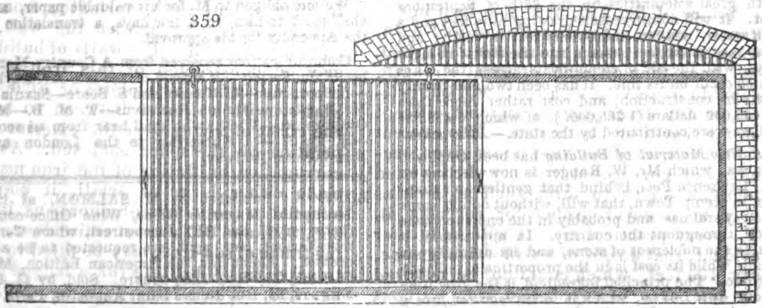

WALKER'S CORRUGATED IRON ROOFS AND GATES.

A new description of iron sheeting for roofs and doors has been recently invented by a Mr. Walker, (of Rotherhithe, we believe,) which, we think, bids fair to supersede in no long time every other. It is called *corrugated* iron, which, in plainer English, means *furrowed*, or *fluted;* and derives its very valuable properties simply from being passed through fluted rollers when in a red-hot state. Mr. Loudon has given, in a recent Number of his excellent Encyclopædia of Cottage, Farm, and Villa Architecture, so complete and satisfactory a description of this improved article, that we gladly avail ourselves of his kind permission to transfer it to our pages:—

"*Corrugated Iron Roofs* are composed of sheet iron, impressed so as to present a surface of semicircular ridges with intervening furrows, *lengthways* of the sheet. By this means the sheet, from a plain flat surface having no strength but from its tenacity, becomes a series of continued arches, abutting against each other, (fig. 348); and the metal, by this new 'position,' acquires strength also from its hardness. To give an idea of the strength acquired, it is observed by Walker, the inventor of this mode of preparing sheet iron, that 'a single sheet of iron, so thin that it will not continue in a perpendicular position, will, after undergoing the process of corrugation, bear upwards of 700lbs. weight without bending in the least degree.' Iron so furrowed will be preferable to common sheet iron for covering a flat roof; because the furrows will collect the water and convey it more rapidly to the eaves. But this is a trifling advantage, scarcely worth mentioning, in comparison with others which follow:—Suppose that in addition to furrowing a sheet lengthways, so as to give it the appearance of fig. 349, it is also bent in one general curve in the direction of its length, so as to give it the appearance of fig. 360, we have then an arch of great strength, capable of serving as a roof, without rafters or any description of support, except at the eaves or abutments. It is evident that, the span of any roof being given, segments of corrugated iron may be rivetted together so as to form such an arch as may be deemed proper for covering it. To every practical man it will be further evident, that a roof of extraordinary span, say 100 feet, which could not be covered by one arch of corrugated iron without the aid of rafters, might be covered by two or three, all resting on and tied together by tie-rods, fig. 351. Further, that in the case of roofs of a still larger span, say 200 feet, a tie-rod might be combined with a trussed iron beam, fig. 352, by which roofs of this span, or even of more than double the extent, might be covered without a single rafter appearing inside. In fig. 352, *aa* are the tie-rods; *bb* corrugated arches, each 40 feet span; *cc* segment rafter of wrought iron, supporting the tie-rod and the roof of corrugated arches under it, and kept steady and strong by the trussing *dd*, &c. In short, no material hitherto brought into notice at all approaches this in its capacities for forming light and economical roofs of the greatest extent of span, and with the least loss of interior room. Its durability will depend on the application of oil or tar paints; for barns, sheep-houses, and various other country buildings, and for all manner of sheds, both in town and country, it is particularly suitable. As the invention has only been known four or five years, much has not hitherto been done with it; but there are several roofs of corrugated iron in the London Docks, and fig. 353 represents a portion of one of them. 'Its length is 225 feet, its width 40 feet, and the height of the columns on which the roof is supported 12 feet. The columns are of cast-iron, a gutter of which metal is continued from column to column, the whole length of the roof; and in the gutter rests the edge of the roof. The arch is formed of several sheets of iron, curved in a reverse direction to the corrugated arches, as shown fig. 353, and rivetted together longitudinally. Similar arches, connected to each other by rivets, compose the roof; every corrugated arch forms a water-course, ending in the gutters at the sides, and thereby rendering it quite waterproof. To give stability to the whole, a tie-rod (fig. 354) is carried across the shed from each column to the one opposite. Between this shed and the brick wall is a lean-to corrugated roof, forming a half arch, springing from the gutter and resting against the wall,' as shown in fig. 353. The walls of buildings may be constructed of this iron set on edge, either in single plates or of double plates, with a vacuity between to lessen the effect of changes in the exterior temperature on the space enclosed. As the corrugation or fluting of the iron may be made either large or small, it may be adapted to the panels of doors, as in fig. 355, 356, and 357; or an entire door, with the frame of rod-iron, may be fitted in so as to serve as a substitute for a ledged door, fig. 358. The sliding-gate, fig. 359, has been erected as an entrance to one of the docks. The frame is of the usual con-

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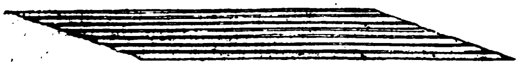

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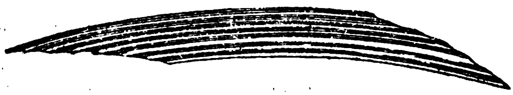

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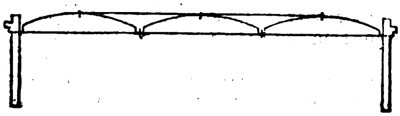

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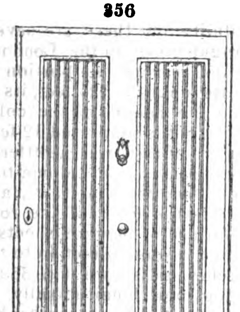

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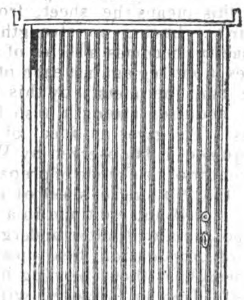

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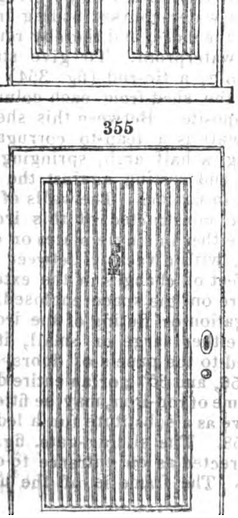

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struction of timber, and inserted in a brick wall. The gate is composed of sheets of corrugated iron, rivetted together so as to form one large panel, the size of the opening; the foot of this gate rests in a groove, as shown in the section, fig. 360, *b*, made of timber or stone, and imbedded in the earth so as to be level with the roadway. On the upper edge are two grooved wheels, which work on an iron ledge-groove *a*. Shutters to shops may be made of this description of sheet iron, as well as chests, and a variety of other objects will easily occur to a practical man. The following are the prices at London in 1832:—Roofs per square of 100 feet, £5. 10*s*.; verandas per square, £7; and doors of the ordinary size in six panels, as in fig. 357, £2. 10*s*. each. This description of roof is not particularly applicable for small-sized cottages, but may be used for large ones; and for smithies, carpenters' shops, and all manner of sheds, it seems particularly appropriate. Portable houses might be very readily made of it for exportation; but wherever such houses may be erected, they must be covered with ivy, or some other evergreen creeper, to moderate the effect of changes in the exterior temperature."

STEAM-TRAVELLING ON COMMON ROADS.

Sir,—Much ink has been expended *pro* and *con* on the subject of steam-travelling upon common roads. That the practicability of so travelling should ever be doubted, seems to me about as reasonable as the prophecies of the failure of all steam-boats, which were so rife at the period of their first introduction. The possibility of a tunnel under the Thames laboured under the same objections, till Mr. Brunel "practically" made a half-one; and he would be glad now to make the other half, but for the new difficulty—the question of its utility when finished. I was one of those who rode in the Regent's Park upon Mr. Gurney's carriage when it was first put in motion, and I then considered the problem of practicability decided, nothing more being required, except experimental details, to make the necessary advances towards its perfectibility. Mr. Gurney's coach, at that period, saying nothing about the principle, was as disgraceful a specimen of workmanship as ever was put together. The only thing about it which astonished me, was the fact that it did not fall to pieces. In that condition it travelled, if I recollect right, some ten miles per hour. But when the steam-travelling on railways was commenced, the infinite superiority of that method entirely deadened the public enthusiasm for the other; and those experimentalists who have since been pursuing it, have done it mostly at their own expense, under very disheartening circumstances. It is questionable whether they will succeed to any extent, until bodies of people shall find an interest in taking them up. On the City-road it seems a very desirable thing that the power of steam should drive away the horses, which at present are very cruelly treated in the innumerable omnibi there plying.* It is found in practice, that it is more profitable to "get the go out" of the horses in a short time, and replenish by fresh purchases, than it is to use them fairly, and thus prolong their existence to its natural period. The West Indians had discovered this fact with regard to their "niggars," during the period of the slave-trade, when the phrase was, "it is better to buy than breed." But even in case of using steam upon the City-road, it would be a more economical method to lay down rails, and also far safer.

Many objections have been raised against using steam at all on roads where horses are used, but these appear to be futile. The horses, it seems, are very much annoyed, and kick and plunge when they hear the noise; but so they do at the sound of a cannon-shot, till they get used to it. Yet, for all that, horses are made to draw artillery, and also to charge up to the cannon's mouth. There are many things now visible, and sounds heard, in the streets of London, which the horses are perfectly accustomed to and heed not, which the horses of former ages never dreamed of. Horses are something like human beings,—very tractable animals, notwithstanding but little pains are taken with either. Let those who may doubt, compare a London brewer's horse with the wild steeds of the desert.

Once upon a time—as the story-books say—there dwelt an old fisherman in a pleasant, sheltered, rocky nook of the coast of Cornwall, on that side of the Land's End stretching towards the Irish Channel. This old fisherman led a very happy life for many, many years, going

* "Very desirable," certainly, but not so practicable. We think this the very worst common road on which steam-travelling could be attempted with advantage.—ED. M. M.

out with his boat in all weathers, and bringing home abundance of very fine fish, part of which he sold, and part of which his dame was accustomed to cook for him in a way he much approved, as the relish with which he partook of them clearly showed. This old fisherman was very much of a philosopher, and of so contented a disposition, that he had never visited a town but once, and that was in his youth, when he was first married, and he rarely left his home for the neighbouring villages, except to procure twine or other materials for the repair of his boat and nets. One night he and his dame—they had no children—were talking over the traditions of the old times, and the wonderful monsters that lived beneath the waters of the deep. Amongst others, the dame told him of a fiery monster which had been seen many hundred years before, that lashed the water with his enormous fins, and vomited forth fire and smoke, so that all the fishermen's boats of those days, which were not swamped by the waves he raised, were consumed by his fiery breath. As the peat fire was burnt out when the tale was ended, the old couple went to bed, and the fisherman had uneasy dreams all night long of the terrible monster, so that he waked up earlier than usual in the morning. The wind was favourable, though rather heavier than he wished, and, going on board his boat, he hoisted his sail, and soon gained an offing of about three miles, where he anchored on a bank which he well knew, where fish abounded. His success was very great; and as the wind abated about mid-day, he lit his fire in a chafing-dish, which was placed on his stone ballast, and cooked some fish for his dinner, though not so well as his old dame could have done them for him. Unknown to her, he had taken a long stone bottle with one ear, and full of genuine Schiedam, to sea with him. He was so rejoiced with his success in fishing, and the good dinner he had eaten, that in pouring the Schiedam out of the bottle into the horn cup he always carried with him, he entirely forgot the water, which, to say the truth, it was always the part of his old dame to remind him of when on shore. He felt so exceedingly happy after drinking the Schiedam, that he quite forgot to replace the cork, and instead of attending to his fishing apparatus, he laid on his back in the stern-sheets of his boat, and while the water of the green sea pleasantly rocked it beneath him, he looked up to the sky and thought how bright it was, and what a beautiful world he lived in. Such delightful sensations naturally induced sleep, more especially as the night before he had not rested well; and most travellers are aware that a noontide sleep in the open air, after great fatigue, has a charm which no other sleep possesses. How long the old man slept he knew not, but when he waked up with the heavy rocking of the boat, it was quite dark and blowing a stiff breeze. He felt his ribs quite sore, and could not tell the reason, till he found that they had been pressing upon the stone bottle, which was entirely empty. This latter circumstance very much annoyed him, as he knew that his good dame was accustomed to speak her mind freely upon such occasions, especially as the Schiedam was good for a complaint she had, and he knew that there was no more left in his house, he having taken the last bottle. While he changed his posture, and sat upon one of the thwarts, with his back to the wind, ruefully scratching his head, he heard a faint rushing noise, and turned round to see whence it arose. For some time he could make nothing out; but at length he beheld, rounding a rocky point, a huge sea-monster, just such as his old dame had told him of the night before. He was swimming at a monstrous rate, and his broad breast dashed a heavy surf before it, while his enormous fins lashed the waters into a foam, with a thundering roar which rang even above the rush of the breeze, and from his lofty, outstretched neck, which glowed like a furnace, clouds of black smoke, intermingled with fiery flashes and volumes of sparks, issued forth. The great strength of the monster was evident, from the fact that he advanced so rapidly towards the fisherman, in the teeth of both wind and tide. The old man was in so terrible a fright at the vision of this horrible animal, that he fell on his knees to pray; but finding that it was still advancing on him, he acquired the courage of desperation, and cutting his cable, he left his anchor behind without even a buoy to mark it, hoisted his sail, and made direct for the shore, throwing his fish overboard as he advanced. Not once looking behind him, he steered straight for the little bight

where his hut was situated, and drove his keel on to the narrow patch of sand. Instantly abandoning his boat, he rushed into the house and took to his bed, exclaiming only, whenever his old dame asked after his ailments, "oh, the monster!" At the end of three days he died.

This is what the Scotch call "ower true a tale." The "monster" was the first steam-boat that rounded the Land's End; and the old-fashioned packet-masters, employed by the post-office ere ten-gun brigs and half-pay lieutenants were devised for the purpose of drowning passengers and increasing government patronage, often tell the tale over their cups.

But it is not upon record that fishermen continue to be thus destroyed; and even as they have got used to steam-boats, horses will, in time, get used to steam-carriages.

There seems to be little doubt that whenever there may occur a competition between steam-carriages and horse-carriages, on common roads, for the purposes of profit, the steam-carriages will win, though far from being so economical as steam-carriages on a railway. But cases may occur in which it will answer the purpose of wealthy persons to uphold common road steamers against railway steamers; as, for example, on the Liverpool road, between which place and London a line of steam rail-road has been contemplated. Along the present road there is a large amount of property, in inns, public-houses, farms, &c., which have produced large profits through the agency of travelling. If the travelling took another track, all this property would be much reduced in value. I have been informed that great exertions are now making amongst the principal coach proprietors and others along this road to get common road steamers introduced, because, even if they should yield a less profit than railway steamers, still it will be decidedly to their advantage so to do, as the other property will thereby be kept from depreciation. It is very possible that this motive of interest will act as a hot-bed to common road steamers, and force them on to some degree of perfection much more rapidly than might otherwise have been the case. Ultimately, of course, railways will supersede them; but a vested interest is a powerful implement in altering a line of road. For my own part, I most earnestly desire to see steam vehicles for common roads rendered perfect, on account of the enormous increase of personal independence which all men of independent habits will thereby gain. Let me not be misunderstood as wishing in any way to detract from the merits of a noble horse. I profess the highest respect for every thing of or belonging to a horse, animate or inanimate, from whip, spur, and bridle-rein, down to the very jockey-dealer, who is born a cheat alike in all countries, and whose natural death in England is hanging. Nothing can imitate a horse. I speak of a *horse* for pleasure-riding or pleasure-driving. No art can make a machine capable of yielding the rapturous enjoyment, the superhuman delight of bestriding a gallant steed, fleet as a deer, and agile as a mountain goat—not riding the noble animal to death in a diabolic gambling match for accursed lucre, but reaping all the delights of nature on the mountain, in the valley, through the green wood, and over the grassy downs, where the gladdened vision stretches over the boundless ocean sea. People "who take an airing" on horseback would do very well with a steam-horse; but he or she who loves to *ride* will be content with no four-legged brute, but must have a *horse* such as Richard contemplated, when he offered his kingdom in exchange. Half of the pleasure of riding consists in the feeling that an animal, which, though tamed, is still full of buoyant spirits, is beneath us, and the conviction that the safety of life and limb depends somewhat on one's own dexterity of horsemanship. There are countries where a horse may be mounted in the morning, ridden all day, and turned loose into the pasture at any hour of the night, without loss or injury; but in England a horse is the representative of a groom also, and prescribed hours must be kept. A man may ride for pleasure at mid-day, and resign his gallant steed to the care of his groom; but in case he rides for business or company-keeping, the thought of his horse or horses, and dependents, will, if he be a man of any feeling, destroy his energy or his pleasure, or, at any rate, lessen them. I speak not of such persons as are accustomed to regard their horses and servants in the way the West Indians considered their "niggers" during the

continuance of the slave-trade, but of those estimable members of society who, with the capacity for a full enjoyment of all the beautiful things of this beautiful world, yet possess enough of the milk of human kindness to regard nothing as a pleasure which is purchased at the price of pain to others. A man visits the abode of intellect, he hears the words of wisdom flowing, and the hated sound of his cab or his carriage being at the door stops all further enjoyment. If he be humane, he cannot condemn either human beings or horses to suffer pain for his gratification. He is seated in the dwelling of beauty; the music thrills, and bright eyes glance on him, while whispered under-tones cheat the lapse of time. A plashing sound breaks the interval of the music, and the rain beats against the window-glass. He trembles as the door opens, and the hated conviction that his dependents are awaiting him is confirmed. Home he must go forthwith, or forfeit his own approbation. Before the groom or coachman can sleep, his horses must be groomed and suppered, or neglected. A wet night will keep the servant two hours on foot after the master has retired. Thinking of these things, one is tempted to exclaim

Oh! for a horse of steam!

Fancy the independence of a small steam Stanhope, which would never grumble or catch cold, wait he ever so long. It is a fact that the food, lodging, and clothing of male domestic servants is for the most part far better than that of common mechanics, who earn but little money; yet scarce one of the latter could be found willing to change situations with the former. The reason, independent of the dislike to personal service, is, that the domestic has no liberty, no time of his own free from restraint. With an arrangement for private steam-locomotion this might be avoided. How independent a man might be, with his supper-table laid the last thing before the servants went to bed,—if he were supperly inclined—a small Bramah's key of the outer door in his vest pocket, and his well-arranged steam Stanhope in a corner of the porch or hall. The servant inquires "What orders, Sir, before I leave work?" "Coal and water the Stanhope for a ten-mile heat!" The friendly residence is gained at an expenditure of three miles of power, leaving an abundant surplus, which should always be provided for. Unexpected wisdom is met with, and the "small hours" are heard without alarm. Beauty fascinates, and music thrills, or friendship takes the tone of godlike nobleness of spirit, and conscience starts not at the shrill sound of the clock. Then may one exclaim in delight, "Blessed be steam! faithful, patient, sober, diligent, coughless, coldless, sleepless, and uncomplaining steam!"

Steam has hitherto been but roughly treated. We have made but a field-negro of it. We have used it for profit alone, and not for domestic purposes. It is time we took it into our houses, while it yet continues our faithful drudge; for I feel by no means sure that we are not on the eve of some great revolution, which, placing "power" in the hands of some new agent, will leave poor steam to be written down in the memory, like the horse of Anastasius, "amongst the things that were." I should think that engineers, while roving the fields of capability, at the seasons when work gets "slack," might devise many new modes of applying steam, out of the old money-earning tracks, as an instrument of luxury. I have often thought that it might be used as a modifier of climates,—not to melt down icebergs at the North Pole, but, still stranger, to soften the intense heat of the tropics. Captain Basil Hall, amongst much apocryphal matter on the subject of America, remarks, that there are some species of annoyances called minor by courtesy, which, if carried through a large portion of time, are more seriously mischievous than what are called great evils. There is sound philosophy in the saying, even though the devil had spoken it. Amongst these annoyances may be reckoned extreme heat and musquitoes. Shah Nadir, of old, was troubled with indigestion, and he had an extremely unamiable custom of appeasing his consequent irascibility by the slaughter of his fellow-creatures, which ultimately led to the shortening of his own days. It is to be feared that the strange decisions of many of our judges have arisen from ill-health; and, at all events, it is certain that no man can possess the power of mental exertion in full perfection, while under the influence of corporeal annoyance. It is

probably owing to this cause that the natives of hot climates have, for the most part, proved inferior to the natives of cold ones, in what relates to the faculty of thinking. It is a just remark of Mr. Hogg, in his Travels on the Continent, "that it must be a difficult thing to study in Germany, on account of the difficulty of keeping up the wood fires to the proper degree of warmth; that is to say, the conviction is forced on the student, that he is the proprietor of a human body, thinking of whose annoyances prevents him from thinking of other things." The annoyance of cold is as bad as the annoyance of heat; but the ready remedy of the former—fuel—has always existed without the necessity of changing the residence; for the latter, there has been no remedy but to bear. Let us take Calcutta, for example, which is ruled over by Europeans, on whom the climate produces such a relaxing effect that it is only during two hours of the early morning that they can take any exercise; and during the night they are obliged to sleep beneath muslin nets to avoid the musquitoes. Under such circumstances, the vigour of mind is gone, and even judges, instead of impartial deciders, become arbitrary tyrants. A common remark I have heard amongst such people, on arriving in a cooler climate is, "What a luxury it is to be able to sleep with a blanket!"

There is no power of thinking in such a climate; yet to think is absolutely necessary for the purposes of legislation. It seems to me that the matter might be accomplished by means of an artificial climate. A circular pavilion might be erected, if possible near the shade of trees. Around one side, at the distance of a few feet, might be erected a thick semicircular wall of bricks; behind this, a steam-engine of the requisite size, provided with an apparatus for making an artificial shower of water to play constantly round the pavilion, and thence run back into the reservoir. There should also be another apparatus of blowers and fanners, worked by the same engine, to drive a current of air across the falling shower. By this double process positive cold might be produced, and no musquitoes would venture near the spot, as these insects can only thrive where there is moisture, warmth, and perfect stillness. It is a curious circumstance that they rarely mount above a few feet from the surface of the earth; and while sailors who sleep upon deck are half stung to death, the wiser ones who take to the round-tops escape. It is to be supposed that living in such an artificial climate would stop the progress of liver-complaint. Might it not be worth the while of an engineer to send out such an apparatus as I have described, as a venture, to India? If it succeeded, a large trade might be carried on, and in process of time East Indians would send for their climate-mills as regularly as West Indians do for their sugar-mills. In the West Indies they have made the discovery, after some score of years possession, that there is a climate to be found in the mountains which saves the necessity of a voyage to England; but in the neighbourhood of Calcutta there is no such remedy. I cannot conceive a failure in the experiment, and should much like to see it tried. If successful, much improvement and increase of energy in the influential members of the government in India might be calculated on as a consequence. It is also probable that the introduction of steam-engines as articles of domestic luxury would be the means of gradually working some change for the better amongst the natives. Those who have ever lived in a hot climate will readily comprehend what an exceeding luxury such an apparatus would be, and how readily people would sacrifice a portion of their ordinary unenjoyed enjoyments to procure so important a means of health and comfort.

I remain, Sir, yours, &c.

JUNIUS REDIVIVUS.

Nov. 5, 1832.

MR. LOUDON AND COTTAGE IMPROVEMENTS.

Sir,—When we see the many misapplications of material in the construction of cottage furniture throughout the agricultural districts of our country, from the ignorance of those who procure it, and from the untutored taste of the village carpenter, I am sorry we must differ from your opinion (p. 31) regarding the introduction of those articles of domestic comfort in Mr. Loudon's admirable Encyclopædia of Cottage, Farm, and Villa Architecture. Indeed, many beside myself have looked forward with

great anxiety to the part of this work that might contain cottage furniture, knowing that this would effect more *immediate good* than even any of the parts which had preceded it. No one who has had an opportunity of visiting the interior of the dwellings of this and other parts of the country can have failed to observe that something to direct the taste of the lower classes in their selection of furniture is much wanted, in order that they may substitute things elegant and comfortable for the equally expensive, unseemly, and uncomfortable articles which they now possess. There are many well-disposed observers who visit the country, and pass from place to place without ever entering any other dwelling than an inn, and who return with an impression that it is *merely* the houses of the peasantry that stand in need of reformation; but we, who have an opportunity of visiting that class of persons at their own firesides, consider that the decoration of a cottage externally is but a secondary consideration, while internal comfort is wanting. Since no one, therefore, can doubt the necessity of some channel for furnishing proper ideas as to the construction of cottage furniture with *economy and taste*, as well as for making known the many improvements that have been effected in articles of domestic use, which those who are remote from towns and cities cannot be expected to be acquainted with—it only remains to determine whether the work in question is a fit place for such information? Now, it is my humble opinion, that in an Encyclopædia of this description every thing connected with the welfare of the cottager should be fully considered; and furniture ought not to be the least of those considerations, as much, very much, of the comfort of the parents, as well as the morals of the children, depends on the interior arrangements of a dwelling.

If the work were confined strictly to architecture, we must have been deprived of the very many useful hints on various subjects that characterise its pages (and which you have yourself dwelt on with approbation), and the talented author would fail in accomplishing the end which he has in view, "of raising the character of the great mass of society in all countries." From the liberal and benevolent sentiments that distinguish all the other publications of this author, as well as the present work, we have no doubt but he looks forward to a time when a complete change in the state of society will have taken place; and his exertions are now directed to pave the way for the coming of this better condition. Although there are many of the notions and propositions of Mr. Loudon that will require some time before they can be realised, yet we view them with pleasure in the distant perspective, and admire every co-operative exertion that radiates to the same distant point, and for the attainment of the same object, namely — bettering the condition and raising the character of the poor, by pointing out what is essential to comfort and moral worth.

I am, Sir,
Your obedient humble servant,
A COUNTRYMAN.
(Chairman *pro. tem.* of the Derbyshire Cottage Improvement Club.)

[We do not wish to press our objection—which, after all, amounted only to an objection to the *form*, not *the matter*, of the information furnished by Mr. Loudon; and to prove to our friends of the "Derbyshire Cottage Improvement Club" how open we are to conviction on this as on all points, we shall here subjoin some striking remarks in support of their view of the case, from a private letter which we lately received, and which was written without any view to publication:—"I do not understand your squeamishness about the difference between the title of Mr. Loudon's new Encyclopædia and the matter thereof? The objection must be allowed, at all events, to come with admirable grace from the editor of a work, which, professing to treat of *mechanics* principally, treats occasionally of every thing else; and, as the Irishman in Cæsar's time used to say, *de quibusdam aliis*. I'll tell you what, Sir Critic of the square and compass, 'tis lucky for you that some folks of great name in art and science have escaped the *cacoethes scribendi*, or they would have demolished you and your furniture scruples utterly. At the Artists' *conversazione*, the other evening, I heard Mr. F., whom I consider one of the first architects in London—if not the first—because he is an architect of reason, instead of one of precedent—say something to this effect, that he thought architecture and furni-

ture so intimately allied that there was no improving the one without improving the other. Mr. A., another architect of great taste, and (considering his years) of great experience, said a great deal to the same purpose. For my part, I have always been of this opinion, and only began to doubt when I saw that you doubted. In the preface to Hope's great work, and also in La Fontaine's work on the same subject, the connexion between architecture and furniture, and the necessity of architects undertaking *both* departments, is (if my memory does not deceive me) very forcibly pointed out."—Ed. M. M.]

MR. HANCOCK'S STEAM-CARRIAGE EXPERIMENTS.

Sir,—Several persons in this place who take a great deal of interest in the progress of steam travelling on common roads would feel much obliged if Mr. Hancock or Mr. Busby would state, through your interesting Journal, the number of days or hours (or both) Mr. Hancock's steam-coach was occupied in making the experimental trip from London to Brighton and back again, including the whole time occupied in taking in water and coke.

I am, your constant reader,

J. H. B.

Birmingham, Nov. 13, 1832.

[We hope to be favoured with a candid and explicit reply to the very reasonable inquiry of our Birmingham correspondent. The great defect of all the statements hitherto sent forth to the world on the subject of steam-travelling on common roads, has been, that they have never contained the whole truth: there has been always some important particular or other suppressed or glossed over. The trial which Mr. Gurney's carriage had on the Gloucester and Cheltenham road is generally referred to, as establishing unequivocally, beyond any other, the superiority of steam over horse-power on common roads. But even with respect to that, we have reason to believe there has been a very considerable degree of mystification practised. We have been informed that Sir Charles Dance, the proprietor of that carriage, does not hesitate to say in private that he was infinitely obliged to the road trustees for furnishing him with so plausible a pretext as they did for abandoning a losing concern; and it is remarkable enough that the name of this gentleman, who could best have told all about it, is *not* to be found in the list of witnesses examined before the late Select Committee of the House of Commons, although he resides at but a short distance from London.—Ed. M. M.]

FOUNTAIN PENS.

Sir,—In No. 483, Mr. Baddeley has described an ingenious fountain pen, a very desirable implement, of which it is not the first, by at least a score. But, alas! it will not answer, any more than those that have gone before it. No fountain of the kind can flow so long as ink continues a gummy substance. When it ceases to be a paint, and becomes a dye, as free from mucilage as distilled water, fountain pens will prosper; but as it is, even an ordinary iron pen becomes clogged after using it a short time. We are somewhat behindhand both with paper and ink. The paper should be in some way prepared to take a dye readily; and that dye should have no gum in it. The size, which is used to give a surface to paper, is frequently greasy, and the annoyance experienced in writing on it is very considerable. Mr. Baddeley will do a great service to all unfortunate writers if he will take these matters into his consideration and find a remedy.

I remain, Sir, yours, &c.

Junius Redivivus.

ESTIMATES FOR PUBLIC WORKS.

Sir,—I for one cannot sympathise with "An Architect and Engineer," (p. 76) in his lachrymose lamentation over what he conceives to be a sign of the low ebb to which *professional* men have come in this day of searching reform. He quarrels with the Blackfriars' Bridge Committee for endeavouring to get the survey done by men of "confirmed reputation and acknowledged skill," at the lowest price. Now this I think was very wise in them: they favoured no one—they economised their resources—and they obtained a talented man.

He says it is impossible for any man to give in a proper estimate for such a survey; and yet it appears that estimates were given in, and that one was accepted

—a pretty plain set down to our Architect's assertion. Does it follow, because public bodies take this course that they are to listen to hungry adventurers; or, that in judging between the parties who come before them, they are to accept the lowest without reference to contingencies? Your correspondent answers this query himself. His own plan is opposed to the spirit of his complaint. What?—Employ a "talented and professional" man at so much a day?—Like a working carpenter and labourer, tie him down to a price?

We have lived in days of profuse extravagance; we have (the uninitiated) seen royal palaces rise and fall at the caprice of professional men who have been paid for their blunders. No wonder, therefore, that public bodies, as well as individuals, are getting cautious, and are aware of the necessity that exists to leave as little as possible to the unfettered discretion of professional men; who, to say the worst of them, are not remarkable for a high-minded neglect of their own interest, or a proud scorn of the sordid pelf which remunerates their useful talent and superior skill.

I am, yours plainly,

A Plain Citizen.

Nov. 3, 1832.

AMERICAN STEAMERS.

Dear Sir,—In your Magazine of the 11th of February last there is a very interesting article on steam navigation by Junius Redivivus. Your correspondent says, that it is a generally admitted fact that the Americans are far before the English in every thing relating to water locomotion. If all that Junius relates of the capability of American steamers were correct, we should certainly be bound to admit that they surpass us very far in this branch of navigation; but I think I shall be at no loss to show that a good part of what he tells us cannot possibly be true. From his description it appears that the George Washington, under the *ordinary* circumstances, makes the distance of 70 miles in four hours and a half, that is, at the rate of 14.482858 miles per hour; and as the extreme circumference of her paddles will give not more than 15.321425 miles per hour, that must be the greatest possible speed of the boat, even if the paddles were acting constantly against a solid medium. It would seem, however, that the George Washington, like the great chief whose name it bears, can on extraordinary occasions literally surpass itself, for Junius assures us that it has "more than once made the distance in one hour and forty minutes," that is, has gone at the rate of *forty-two miles an hour!* Tripping at this rate, it might cross the Atlantic in *three days,* and circumnavigate the globe in *three weeks!!!* We have already seen that about fifteen miles an hour is the very utmost that the vessel could make by means of its paddles and long crank, which being subtracted from forty-two miles, leaves twenty-seven to be accounted for by some other means than any that philosophers have yet heard tell of. I guess it must have been by means of a *very, very long bow.* Junius has been imposed upon.

I am, dear Sir,

Your very obedient servant,

A. Mackinnon.

Sheffield, Aug. 13, 1832.

NEW PUBLICATIONS CONNECTED WITH THE ARTS AND SCIENCES.

The Almanacs for 1833.

Moore's.—We are glad to find that our worthy and venerable friend Francis is not above taking advice. He has this year remedied the material defect pointed out by Mr. Bevan (Mech. Mag. for Nov. 10, 1831,) as common to all the almanacs, in respect to the sun's rising and setting, namely, that it was given for one latitude only, while some parts of England differ from others in latitude more than five degrees. In the calendar pages he gives, as usual, the rising and setting for the latitude of London, but to this there is added a table, showing the rising and setting for the 1st and 15th days of every month at Brighton, Dorchester, Exeter, &c., lat. 50½°; Bangor, Derby, Lynn, &c., lat. 53°; Carlisle, Newcastle, &c., lat. 55°. By this means practical astronomers throughout England will either be spared altogether the trouble of making the corrections required for difference of latitude, or furnished with such close approximations as must materially facilitate the process of calculation. The account of

the eclipses of the sun (2), and moon (3), and lunar occultations (104) for 1833 is, as usual, remarkably full, accurate, and circumstantial. He furnishes a table of the instants, in mean or clock time, of the only eclipse of the sun that will be visible in Europe next year, namely, that on the 19th of July, for *both* Greenwich and Paris, and gives in a note the following stringent reason:—"As I know that my almanac is sold in Paris, and as I have found that the numbers given in the French Nautical Almanac, called the *Connaissance des Tems*, are *more than ten minutes wrong*, I present the above correct numbers for the use of my friends there." What will M. Arago say to this? What Mr. Babbage? The prince of French astronomers eclipsed in accuracy by an old English almanac-maker! Both the French and English nations indebted for their only genuine "*Vox Stellarum*" to the much vilified Francis Moore! Of Francis's "astrological observations and predictions relating to mundane affairs," we have this once more to say, that though of course eminently absurd, as far as the matter of pretension goes, they are all of excellent tendency, as well moral as political. What but good, for example, can arise from such admirable sentiments as are expressed in the following extracts?—

"The aspect of the times, it cannot be denied, is in the highest degree alarming to despots; but we need not be dismayed, for the prevalence of reason, of truth, and knowledge must illuminate all around, and will certainly produce sound and rational liberty, even in those countries of Europe where it is at present but little understood."

"Well, the Reform Bill is now the law of the land. Remember, it is an *instrument*, and if it be worth any thing, *use it*, and don't let it lie bye and rust. Go on, go on, wielding the powers which public virtue confers, with public virtue and a single eye to the general good; then will church mice, and law rats, and parasites, and state jackals, and the caterpillars, which would devour the best of the nation's good, vanish from before you, either into oblivion or contempt."

"The struggles of two worthless, would-be-kings for rule in Portugal, signifies but little to men who think aright. Will either of them seek to bring that neglected people out of darkness, and to make them free, intelligent, and happy? Verily not. The conqueror, whichever lie may be, will, if not prevented by others, seek to consolidate a new kind of power, a more besotted idolatry, a tyranny over conscience, and the grossest oppression. But these evils cannot last long even there, any more than in Poland. He who hath said, '*I will break the yoke of the oppressor*,' still sits at the helm of the world's affairs."

"Great confusion in the courts of *Europe*; edicts after edicts are sent forth to the world with little or no effect; marching and countermarching of armies, with grievous threatenings to the disobedient!

> Great discontent now in the world appears,
> And martial music rattles in our ears.

Perhaps the authors of these things do not know that they are more than a century behind the greater portion of those whom they wish to coerce. They may learn a lesson even from Edmund Burke, who said, that 'Education is the cheapest defence of nations.'"

Instead of the friends of education and knowledge calling out for "the destruction" of Francis Moore, as some indiscreet zealots amongst them have done, they should rather be thankful that a personage who exercises so large an influence on popular opinion, is uniformly of so sound and liberal a cast of thinking.

Partridge exhibits the same improvement in regard to the sun's rising and setting as Moore; and a like abundance of correct astronomical information, including some very good practical observations of his own on the use of telescopes.

Moore's Improved is, notwithstanding the universality of the title, not at all to be compared to old Francis as a celestial ephemeris; and is only superior to it in respect of the quantity of information which it contains on farming, gardening, and other subjects of peculiar interest to the rural population of the country. The most striking novelties this year are a collection of "Curious Facts on Botany," most of them as instructive as they are curious; and a table "showing the proportion of population to an acre, and of crime to population in 1831, in the manufacturing and agricultural counties." It appears from the latter, that while in the great manufacturing county of Lancaster the proportion of committals for trial is one in 530, the proportion in Northumberland is only one in 2,470!

The Ladies' and Gentleman's Diaries are better (even) than they have been for some years in the critical, mathematical, and philosophical departments, for

which they have been so long renowned, and no worse in their "enigmatology." We observe the venerable Mr. Sampson, the oldest living admirer of Lady Di again in the field; and many worthy successors to the Emersons and Simpsons of former days.

White's Ephemeris, edited by Doctor Gregory, takes its stand, as usual, at the head of the purely astronomical almanacs. We shall extract from it the only good account which we have yet met with of last year's transit of Mercury:—

"The transit of Mercury, May 5th, 1832, does not seem to have been observed throughout any where in England. At Greenwich, the Astronomer Royal obtained a very satisfactory observation of the immersion of the centre. The instrument selected was the eastern (or Sir George Shuckburgh's) equatorial, furnished with a beautiful double-threaded micrometer by Dolland. The sun's limb was made to run along the equatorial wire of the instrument, and the moveable wire was adjusted to the path of Mercury as nearly as possible by a previous calculation of Mr. Richardson. So nearly was this operation peformed, that, on the momentary appearance of the planet, it was almost bisected by the wire. The versed sine of the chord thus measured by the micrometer was found equal to 2m. 34s. 5; the mean time of internal contact, 21h. 2m. 55s. 76; and the diameter of Mercury by a mean of 3 measures, 11s. 38. I, who was then at Greenwich for the purpose, saw the planet on the sun's disc immediately after the internal contact. It was distinctly defined, but the sun was immediately afterwards covered with clouds. I then went to Sir James South's Observatory at Kensington. He had seen the planet at or near the ingress. I remained at Kensington till the transit was over, but a cloudy sky precluded any farther observation. The Rev. J. Fisher observed the transit at Lisbon, lat. 38 deg. 42m. 30s. N., long. 36 deg. 40m. W. with a 45-inch refractor by Dolland, aperture 8¼ inches.

	Mean Solar Time.				Apparent Time.			
	D.	H.	M.	S.	D.	H.	M.	S.
Ingress exterior....	4	20	22	46	4	20	26	15
Egress exterior....	5	3	12	16	5	3	15	46

At Geneva M. Gautier observed the first contact at 21h. 24m. 57s., and the final contact at 5d. 4h. 13m. 28s. The diameter of Mercury observed by M. Chatelain at the middle of the transit was *about* 11½s. In our computation last year, we assumed 11s. 4."

The Englishman's Almanac has been compiled this year with an extraordinary degree of pains, and with an apparent determination to bid defiance to all rivalry, both as respects quantity and quality. Its most novel features are a series of elaborate tables, "all original, and exclusively composed for this almanac;" in which are exhibited the amount of the population of England and Wales at several periods—the comparative number of baptisms, marriages, and burials which have taken place—the chief public burdens imposed—together with the number of committals, convictions, and punishments; the whole forming a complete view of the internal state of the country for the last twenty-one years.

The Tradesmans' and Mechanics' Almanac contains somewhat less matter than the Englishman's, but many peculiar heads of information, which are admirably calculated to recommend it to those classes of the community for whose use it is designed. For example: a table showing the chief manufactures of each county; a list of the principal manufacturing places; laws relating to apprentices, journeymen, servants, tenants, &c.; the *new* duties on imported goods, &c. "Facts and Calculations for the Curious," and "Chronology for the Curious," are the running titles of several pages of most interesting reading. Take a few brief examples:—

"A mad enthusiast, a private in the Life Guards, predicted that London would be overthrown on a certain day, when an impudent quack sold a cargo of pills, which he assured the people were *good for earthquakes*—1750.

"John Taylor, to whom we owe the gilt button, the japanned and gilt snuff-boxes, with the numerous race of enamels, the painted snuff-box, (for the painting of which, at a farthing a-piece, one workman earned £3. 10s. a-week,) died worth a quarter of a million in 1775.

"The postman who is the medium of communication between the coasts of the Pacific Ocean and the provinces which are situated on the east of the Andes, *swims* for two days down the River Chamaya, and through a part of the Amazons, carrying his bag of letters wrapped about his head like a turban. There is scarcely an instance of the letters ever having been lost or wetted."

NOTES WORTH NOTICE.

"If every thing worth notice had always been taken notice of, by this time there would have been nothing new worth noticing."

The Gresham Lectures.—Within these few days numbers of handbills have made their appearance in the City, calling on the public to attend the gratuitous courses of lectures at the Royal Exchange, which, it being term-time, are now in process of delivery; and also enumerating the subjects and the names of the lecturers. Of course, this bill cannot be the production of any friend to those ancient sinecurists, the professors, who would be put to their wits' end if so abominable a measure should have the effect of bringing together a legal congregation at every stated time of their holding forth. Their only consolation is, that the said time happens to be the very middle of the day. Whoever it may be that has taken the trouble to print and distribute these bills, he deserves thanks for endeavouring to "do the state some service," and hearty wishes that his endeavours may not be in vain. If the professors can be forced to do their duty for only one term, it will be a great step towards a complete victory over the wretched system by which the noble intentions of the "princelie merchant" have been hitherto perverted.

Middle-aged Mechanics.—At the Liverpool Mechanics' Institution, amongst others a series of lectures is being delivered "On the Literature of the Middle Ages." Is not this a complete departure from the original design, which contemplated, exclusively, instruction to the workman in the Useful Arts?

Negro Colony of Liberia.—This self-styled "philanthropic" undertaking turns out to be a mere delusion—a scheme set on foot by the American slave-owners to rid them of their increasing terror, the "free blacks," and also, to use their own language, to provide a *drain* for the surplus population of slaves, which, without some such measure, they are afraid will in a few years become numerous and powerful enough to cast off their shackles. With an eye to self-interest, in which our Transatlantic brethren are seldom deficient, they at first contrived to invest this plan with such alluring colours, that, by giving highly-wrought statements of the wonders it was working, and by sedulously concealing all its more disgusting characteristics, they actually succeeded in drawing subscriptions from the pockets of a number of English philanthropists, towards expatriating the free blacks from their native country, and perpetuating the system of slavery in that supereminent "land of the free," the United States! and this, too, at a time when the condition of our own colonies demanded the highest and most exclusive attention of every one interested in the question. Whether Liberia is prosperous or no, it appears that the parties most concerned—the free persons of colour in the States,—are as averse to transportation from the land of their birth as their white oppressors can be: so averse, that in Virginia a law was actually proposed for effecting their removal by absolute force! According to the negro newspaper, too, *The Liberia Herald*, the State of Georgia has recently, provoked by the fear of loss of "property" from the increasing numbers and intelligence of the black population, made it *a penal offence* for any person to teach reading and writing to any slave, or to "any FREE *person of colour!!!*" These facts, which have been lately brought forward, chiefly through the instrumentality of Mr. Cropper, of Liverpool, and have not been answered in any way, together with the crowning one, that "the Colonisation Society stands pledged to the slave-owners of America not to interfere with the system of home slavery," must prove fatal to their hopes of future assistance from the Abolitionists here, and will surely operate to spare their "agent" the necessity of residing longer in England!

London and Bristol Railway.—The recently-projected plan of a railway to run from London to Bristol, meets with warm support, especially from the principal merchants of "the metropolis of the West," who hope, by means of the rapid communication with the capital which the proposed road will render practicable, to recover a share of that commercial importance of which their city has been deprived by the superior activity and enterprise of Liverpool. If the present enthusiasm in favour of the plan should continue only for a short period, there can be little doubt that it will be carried into execution as soon as an Act of Parliament can be procured. The editor of *Felix Farley's Bristol Journal*, for example, is so fully persuaded of its importance and utility, that he has pledged himself "never to send forth a number of his paper without some article urging its adoption, until the railway is undertaken!"

London Arcade.—For some years Mr. Peter Jeffery, the gentleman who has been so actively engaged (although only an amateur) in the arrangement of the London Bridge approaches, has also endeavoured to procure the erection of an arcade, or covered way, from the bottom of the City-road to the Bank, so that foot-passengers might be able to take the nearest way to "the heart of the city,"

and, at the same time, avoid the dangers and disagreeables of that clogged-up thoroughfare, Coleman-street. Some progress has been made in this, notice having been just given to Parliament that an Act will be applied for, next session, for the necessary powers to build the arcade, and compel the owners of the adjoining houses to dispose of them to the Company which is to be formed for the purpose. There is, however, one very great objection to the plan—that it will throw a greater obstacle than ever in the way of continuing the City-road to the Bank, and thence, by widening Prince's-street, &c., effecting a direct communication with the grand street to lead from the Mansion House to New London Bridge, which has been, it is understood, determined upon by the City, and is likely shortly to be commenced.

Mr. Owen's Pennyworth.—In the notice of the Penny Press which recently appeared in the Mechanics' Magazine, by some accident no notice was taken of *The Crisis*, a penny paper set on foot by Mr. Owen, for the promulgation of his peculiar doctrines, and published at the Working Men's Institution in Gray's-Inn-lane-road. The nature of its contents may be pretty well guessed at; and the printing and getting-up are excellent, as they well may be, considering the small quantity given for the money, in such cheap times as the present. By a slight error in the same article, the number of penny publications was stated at forty-three, whereas (including *The Crisis*) there are actually forty-seven—and two or three have been added within this week or two.

Scotch Statistics made Easy.—As a proof that it is not always the French only who are more bold than correct in their statistics, reference need only to be made to Chambers's Life of Sir Walter Scott, which "took ten years in composing!" Here we are very gravely told, that some idea may be formed of the magnitude of "the concern" (commercially speaking) of the new edition of the Waverly Novels, from the simple fact, that setting out of view those concerned in the *sale* of the work, it *maintains* in employment, in the "getting-up" alone, no less than one thousand persons! We have just before been informed, that the number sold of the work amounts to about 20,000. The public buy these at 5*s*. each, or £5000; but "advertisements," "the trade," "the publisher," and "those concerned in the *sale*," swallow up at least half of this, so that we have at last 12*s*. 6*d*. a-week for each of the thousand persons employed, including the master printers, bookbinders, stationers, paper-makers, &c., and *including* Sir Walter Scott himself, who cleared some thousands per annum by the speculation! This is truly the way to form "an idea," if an outrageously absurd one will do.

ANSWERS TO INQUIRIES.

The Number of Comets is still entirely matter of conjecture. More than 500 are recorded to have been observed; but the late lamented Professor Leslie, calculating on the principle of chances, found that we may reckon on these erratic attendants of our system as amounting to not less than two millions; and Mr. Milne, in his excellent Essay on Comets (which we would advise "Orion" to consult) carries the estimate as high as 11,200,000!

Cast-Iron Ornaments.—Mr. Mackinnon informs us that the cast-iron ornaments, respecting which an inquiry was made in Mech. Mag. for Dec. 24, 1831, are cast at the Adelphi Iron-Works, near Chesterfield, and sold wholesale by a Mr. Ashwell, of London.

The Nautical Almanac for 1834 ought to have been published by this time; but we cannot tell the "Constant Reader," who is "about going on a long voyage," what is the cause of the delay, or when the work is likely to appear. It is certainly much to be regretted that the new Board of Superintendance has not been more on the alert; some allowance, however, must always be made for the difficulties peculiar to all first endeavours.

Cabinet Makers.—Mr. Robert Potts, who has favoured us with some remarks on Mr. Downing's letter, which we may hereafter lay before our readers, adds in a postscript, "I have been requested by several Cabinet-makers to ask you, Mr. Editor, if you think them less intellectual as a body than other trades, as you say you were astonished to see *Cabinet-maker* attached to Mr. Downing's letter?" We lose not a moment to reply, that nothing was further from our intention than to insinuate any thing of the kind respecting this highly intelligent and respectable trade. We felt astonished simply because the addition of "Cabinet-maker" showed that the writer of the letter was of the order of hard-working mechanics, and should have been equally so had the addition been "Engineer," "Millwright," "Printer," or any thing else.

Steam-Carriages.—"Velox," of Liverpool, has sent us a design for a steam-carriage, which he is "desirous of having constructed under his guidance," with a request that we will lay it before our readers, accompanied with certain queries, to which he is desirous of having answers—as, for example, whether the boiler will generate steam enough?—what thickness it should be of? &c. We are sorry to say that we can see nothing in his design which should induce us to comply with his request. The arrangements he proposes evince an utter ignorance of the matter he has taken in hand. He should call some regular engineer to his aid, and leave the matter to him.

Boring for Water.—We are unable to refer J. H. to any work which treats with *sufficient* minuteness of the process of boring for water. He will find in the Quarterly Journal of Science, for the Spring quarter of 1824, a very good account of the process followed in boring for water in the Horticultural Society's Gardens at Chiswick; and in our own work, vols. 4th and 5th, contributions on the general subject from Mr. Monnom, Mr. Edge, and others.

Raising Sunken Ships.—The author of some medical productions, which have been very well spoken of by his professional brethren, observes in a recent communication to us:—"There is reason

to believe that a method is practicable by which, after certain preliminary steps, the power of a single man may be so employed as to raise a large ship from the bottom of the sea; and that without resorting to the use of tackle-falls, rafts, pulleys, &c., as now practised." And "as such an advantageous method, made known to the world, could not fail to prove highly valuable," he desires to know "how this might be effected?" We consider this rather a lame conclusion to so remarkable an announcement. The inquirer ought to state his own reason for believing that such a method is practicable, in order to entitle him to the assistance he solicits.

GLASS MANUFACTURE.—We think "An Optician" is mistaken in supposing that any relaxation has taken place in the excise laws respecting glass, in favour of persons engaged in experimental investigations. The only alteration made during the last Session of Parliament consisted in a reduction of the duties from 12*l.* 10*s.* per 1,000 lbs. to 10*l.*

CASTOR OIL.—Sir, I beg leave to state, in answer to your Correspondent "Castor's" inquiry, that he is right in his conjecture, that the oil is contained in the seeds of the plant; and the way in which very good oil is made from them in the Cape (where the plants are very plentiful) is simply by bruising the seeds, and then boiling them, carefully skimming off the oil which rises to the surface. It may then be rendered more pure by filtration. The chemists may have a different way of managing the matter, but I see no improvement in their "cold-drawn" castor oil over that which was prepared in the above simple way. In 1823, I brought many seeds over, and they all grew very high, but no seeds appeared; and a gentleman who had planted them in his garden, found them in his way, and so rooted them up: I should be glad if "Castor" would be kind enough to tell me how he managed his plants, their age, &c.—I am, Sir, &c., OWEN SMITH, (late from the Cape,) 3, Copthall-buildings, Bank.

Ship-worms.—The ingenious Abbé de la Pluche has speculated on the use of these destructive animals. They open, he says, a source of considerable riches to the inhabitants of Sweden, by employing the vigilance of the Dutch, and imposing upon them the necessity of continually tarring and repairing their dikes and Indian vessels. The Teredo, in this manner, he thinks, serves to form a bond of union between the two commercial nations, by occasioning a perpetual demand for oak, pitch, and fir. As these apparently pernicious animals, he continues, are perpetually at work at Amsterdam, for the advantage of Stockholm and Archangel, so the labours of others in the North are equally profitable to the Hollanders, by promoting the consumption of their salt, spices, and grocery, which are annually exported in large quantities, either for the purpose of seasoning and preserving the provisions of their Northern neighbours, or to cure the fish which they use instead of bread.

Moving of the Ears.—It is recorded of M. Metz, surgeon of the Hôtel Dieu, Paris, that he had the power of moving his ears as animals do. A similar power has many times been observed in others, and may be accounted for on the accidental strength of the small muscles of the ear, which, in most individuals, only serve the purpose of rendering the shell of the ear more tense.

LIST OF NEW PATENTS GRANTED BETWEEN THE 20TH OF OCTOBER AND THE 20TH OF NOVEMBER, 1832.

Alexander Stocker and William Southwood Stocker, both of the Union Rolling Mills, Birmingham, for various improvements in machinery for manufacturing iron and other metal tips for the heels and toes of shoes, chain-links, and other articles. To enrol within Six Months from October 22.

Sherman Converse, of New York, in the United States of America, at present residing in Ludgate-hill, London, gentleman, for an improvement in making or manufacturing fire grates. Six Months; Oct. 22.

George Frederick Muntz, of Birmingham, metal-roller, for an improved manufacture of metal-plates for sheathing the bottom of ships and other vessels. Six Months; Oct. 22.

John Bourne, of Ilchester, road-surveyor, for a machine for scraping or cleaning roads and other ways. Six Months; Oct. 22.

Leopold Foucaud, of George-yard, Lombard-street, in the city of London, merchant, for an improvement or improvements applicable to the priming of percussion-locks of guns and pistols. Communicated to him by a foreigner residing abroad. Six Months; Nov. 2.

George Oldland, of Hillsley, in the parish of Hawkesbury, Gloucestershire, clothworker, for certain improvements in machinery or apparatus for preparing, dressing, and finishing of woollen cloth and other fabrics. Six Months; Nov. 3.

Henry Scrivenor, of New Broad-street, London, gentleman, for a certain improvement or improvements in the construction of iron railways. Two Months; Nov. 3.

Elijah Galloway, of Carter-street, Walworth, engineer, for improvements in steam-engines and apparatus for propelling. Six Months; Nov. 7.

William Wilkinson Taylor, of Bow, Middlesex, felt-manufacturer, for an improved cloth for the sails of ships and other vessels. Six Months; Nov. 8.

John Burlingham, of Old Buckenham, near Attleborough, Norfolk, for certain improvements on mills or in machinery to be operated upon by wind, and applicable to the grinding of corn and other purposes. Two Months; Nov. 8.

Joseph Lidwell Heathorn, of Change alley, Cornhill, London, shipowner, for certain improvements in rigging for ships and other vessels. Six Months; Nov. 13.

Thomas Spinney, of Cheltenham, gas-engineer, for an improved earthenware retort for generating gas for the purpose of illumination. Six Months; Nov. 13.

James Vincent Desgrand, of Size-lane, London, merchant, for a certain method of weaving elastic fabrics. Communicated to him by a foreigner residing abroad. Six Months; Nov. 13.

Samuel Jones, of the Strand, St. Clement's Danes, manufacturer, for a certain improvement or certain improvements in apparatus, or part or parts of apparatus, for producing instantaneous light. Six Months; Nov. 20.

Jacob Perkins, of Fleet street, London, engineer, for an improvement in preserving copper in certain cases from the oxidation caused by heat. Six Months; Nov. 20.

INTERIM NOTICES.

Communications received from Mr. Symington—T. J.—T. M. B.—R. D. L.—An Old Stager.

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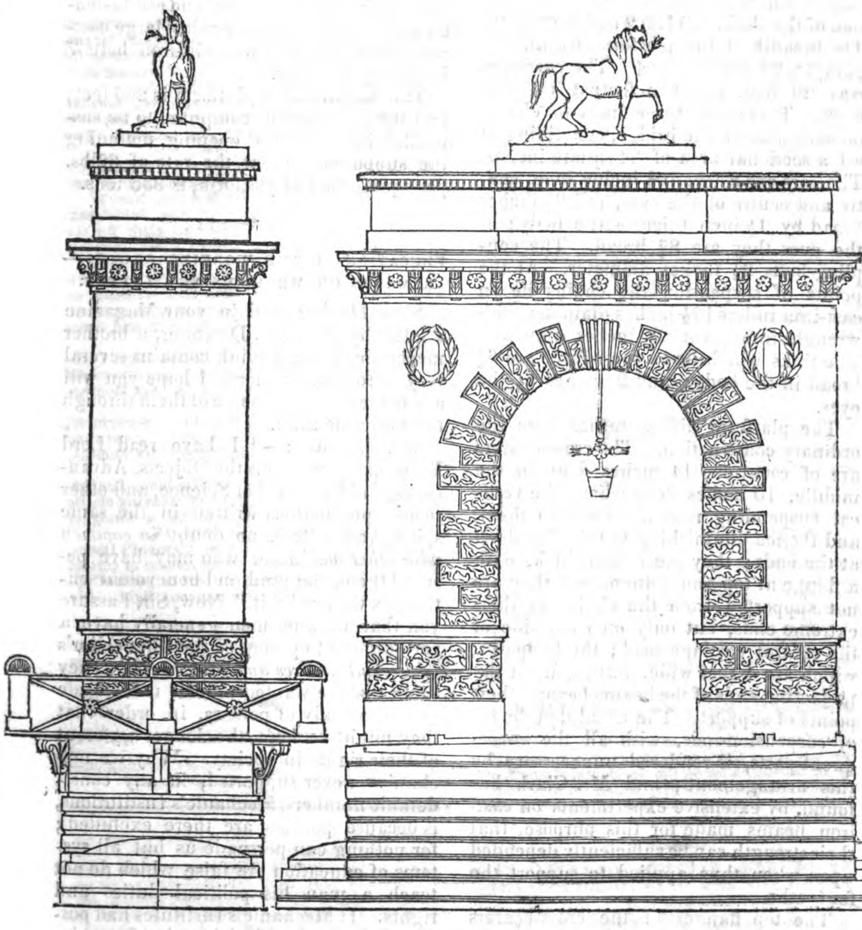
MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 486.] SATURDAY, DECEMBER 1, 1832. [Price 3d.

NORFOLK SUSPENSION BRIDGE.

Fig. 2. Fig. 1.



THE NORFOLK SUSPENSION BRIDGE, NOW ERECTING AT NEW SHOREHAM, BY MR. TIERNEY CLARK, CIVIL ENGINEER.

(From Drewry's Memoir on Suspension Bridges.)

This is a very beautiful bridge, now in course of erection under the direction of Mr. Tierney Clark. The general arrangement is similar to that of Marlow and Hammersmith Bridges. But the architecture of the archways that form the main piers is altogether richer and of greater beauty. (See figs. 1 and 2.)

The chord-line between the points of suspension is 284 feet, and the deflection of the chains 20 feet 2 inches $=\frac{1}{14\frac{1}{1}}$th. The breadth of the platform within the parapets 28 feet 6 inches. The carriage-way 20 feet, and two footpaths 4 feet each. There are three lines of chains on each side of the bridge, containing in all a sectional area of 84 square inches. The bars are 8 feet $10\frac{1}{2}$ inches long, centre and centre of the eyes, and $6\frac{1}{4}$ inches broad by $1\frac{1}{8}$ inch thick in the body; at the eyes they are $8\frac{3}{4}$ broad. The coupling-bolts $2\frac{1}{2}$ inches diameter. At the points of suspension the chains lie on cast-iron rollers $10\frac{1}{2}$ inches diameter, with wrought-iron pivots $2\frac{3}{4}$ inches diameter. The links which lie on the rollers are $6\frac{1}{2}$ broad in the body; and 9 inches at the eyes.

The platform differs rather from the ordinary construction. The cross-bearers are of cast-iron, 14 inches deep in the middle, 10 inches deep where the vertical suspending rods are fixed to them, and thence diminishing to 6 inches deep at the ends; they are 1 inch thick, with a flange at top and bottom, and they are not supported from the chains at their extreme ends, but only on each side of the central carriage-road; the footpaths, which are 4 feet wide, resting upon the projecting ends of the beams beyond their points of support. The usual double set of suspension-rods, with all the consequent parts, is rendered unnecessary by this arrangement; and Mr. Clark has found, by extensive experiments on cast-iron beams made for this purpose, that their strength can be sufficiently depended upon when thus applied to support the footpaths.

The top flanges of the cross-bearers have knobs cast on them for securing the roadway planking, which is of oak, 3 inches thick; and over that is laid another course of timber, alternately flat and endwise of the grain upwards.

In this bridge there is a central arched opening through the main piers for the carriage-road; and the footpaths are turned outside the piers (as shown in fig. 2), projecting out beyond their sides, and supported upon proper cast-iron consols.

The abutments are of solid work, consisting of brick and stone work, weighing each 900 tons. The backstays go off from the main piers at a different angle to the central chains, passing through tunnels in the abutments, and are fastened at the back of them against large cast-iron plates, by oval wrought-iron bolts 7 inches by 3 inches.

The length of the platform is 268 feet; and the total weight computed to be suspended in the central opening, including the supposed load at the rate of 62lbs. per square foot of platform, is 356 tons.

EDUCATION OF THE WORKING CLASSES— REMARKS ON MR. DOWNING'S LETTER.

Sir,—Having read in your Magazine a letter by Mr. Sam. Downing, a brother mechanic, which I think contains several very erroneous notions, I hope you will allow me to reply to some of them through the same medium.

Mr. D. says:—" I have read Lord Brougham's work on the Objects, Advantages, and Pleasures of Science, and other recent productions written in the same spirit, and I feel, no doubt *in common with other mechanics* who may have perused them, the kind and benevolent sentiments they exhibit." Now, Sir, I assure you that working men generally have a very different opinion of the Chancellor's *benevolent motives and sentiments.* They think that he wanted to lead them aside from the study of politics, in order that they might be kept the longer ignorant of their rights in society. Why we mechanics never supported, in any considerable numbers, Mechanic's Institutions, is because politics are there excluded; for nothing can persuade us but all systems of education are false which do not teach a man his political duties and rights. If Mechanic's Institutes had possessed the power of giving the franchise to every member who had acquired

knowledge enough to use it beneficially, there would have been a Mechanic's Institution in every parish.

Speaking of the advantage of knowledge to a workman, Mr. Downing says:—"That it injures a man in the eyes of his fellow-workmen: they pronounce him to be under a delusion, and their pity is perhaps *exchanged for something worse.* He is injured in the eyes of his employer by the bad opinion of his fellow-workmen." I am sure, Sir, that Mr. D. has here libelled his fellow-workmen. Whenever a man has come into a workshop, where I have been employed, who had a character for intelligence, he was always treated with kindness, and looked up to with respect. But when persons of this description have chosen, to use a common expression, to "give themselves airs," they then get very properly censured for their vanity, though never, as Mr. D. insinuates, persecuted for their intelligence. As to a man being injured in the eyes of his employer, the notion is absurd. Masters employ those persons who suit them best, without caring a fig about their literary acquirements.

But Mr. D. further asserts, that a little knowledge makes a man discontented and miserable—leads him to envy others' comforts, and neglect his own. I think, Sir, that ignorance must produce those effects, not knowledge. A little knowledge, in a healthy mind, will gradually raise a person in his own estimation: angry murmurings will give way to social feelings; a noble pride will swell his breast; in one word he will learn to *respect himself.*

Mr. D. next draws a very unfavourable picture of National Schools, and arrives at the conclusion that they have done more harm than good. I believe they have done the contrary of this. I admit that they are not what they might be; but they teach the children to read at least, and poverty will soon make them think. I look on National Schools as but the beginning of a great system of public Education, that will place within the reach of all, equal facilities for intellectual cultivation.

As Mr. D. has not only given you his name, but also his profession and address, I rather reluctantly do the same.

And am, Sir, your obedient servant,

ROB. POTTS, Carver,

No. 4, Southampton-street, Euston-square,
November 20, 1832.

Sir,—Relying on the character of impartiality which has ever distinguished your Magazine, I venture, notwithstanding the high praise you have awarded to Mr. Downing's letter in your last number, to enter my protest against its bearings. I am the more induced to reply through the same channel, because I remark that your commendations go no farther than an expression of admiration at the "originality of thought, beauty, and force of language and brilliancy of illustration," contained in this elaborate production. The *argument* you leave untouched.

Without entering on any lengthened comment, which in fact the declamatory style of the writer almost excludes, I beg to ask whether there is not apparent in Mr. Downing's letter a deep tone of prejudice on the (alleged) hostility borne by the rich to the poor? To me there appears a bitterness of spirit throughout which would make me listen with great caution to any accusations coming from such a quarter. I pass over much of what is too vague to be grappled with, and come at once to a subject on which Mr. Downing's complaints are loud and vehement, the system of National Schools. I ask whether charges which, if well-founded, must be so deeply injurious to this class of institutions, should be brought forward without the most solid proofs? Why is a subject so important as this to be treated in a strain of angry invective. Truth was never a loser by calm and temperate discussion. I pretend not to advocate the cause of national or any other schools; I only wish for impartiality; and I have yet to learn that the odium with which your correspondent would load these establishments is in the least degree deserved. Yet he coolly takes it for granted. The only fact he has brought forward (p. 102), can scarcely bring conviction to those who are accustomed to other arguments than those of declamation. I repeat that specific charges should have been manfully and temperately advanced, and not built upon as if their truth were universally acknowledged. "The idea," says Mr. D., "of placing your child in a National School, is debasing." How many parents will join him in this assertion? If the dissatisfaction with these places of education be general, why have we not heard a greater outcry against them? Are we to take the morbid sensibility of one or

two, or half a dozen parents, against the common-sense of all the rest?

But I am inclined to think that Mr. Downing's hostility is more against the general system of school-education than against the particular economy of National Schools. Most of the evils he so bitterly deprecates are to be found in all moderately large schools. "Confinement, constrained silence, the confined breath of many scholars," are no novelties in our academies. Why, then, this "peculiar rancour" against National Schools? Have they a tendency, more than other places of education, to engender consumption, and to cramp the energies of their "victims?" Better to say at once "the whole system of school-education is ruinous to the body and mind of the pupil."

I dare not trespass further on your time, than to express my opinion that this invidious attack on National Schools is calculated to effect great mischief amongst that numerous class of our fellow-citizens for whose use they were instituted; and not the less so, that it appears in so influential a work as the Mechanics' Magazine, and backed by the high eulogiums of its able editor.

I am, Sir, your obedient servant,

VERAX.

London, November 20, 1832.

Remarks by the Editor.

"Verax" has very fairly remarked that in our commendation of Mr. Downing's letter, we spoke of the style only, and left the "argument untouched." It is not to be supposed, however, that we would have given a place in our pages to a production so well calculated to make an impression on the popular mind, had we differed to any considerable extent from the sentiments which it contains; and now that it is charged with a tendency to "great mischief," we shall not shrink from stating explicitly how far we are disposed to share the responsibility with the author.

We take the general scope of Mr. D.'s letter to be this—not to depreciate education, which, in so bright an example of its advantages, would have been supremely absurd—but to show, *first*, that much of what goes by the name of education is of so spurious a sort as to be of little worth; and, *second*, that it is of small avail to give poor men knowledge, while they are denied equal facilities with other men to turn it to a profitable account.

Now, on both points we think Mr. D. entirely in the right.

Mr. D. has exemplified the *first* by the case of the National Schools; but he has said nothing worse of the system of education there pursued than has been said twenty times before by writers of the greatest eminence and of unquestionable impartiality. No further back than the beginning of the present year it was observed of this system in the *Journal of Education*, No. V., published under the superintendence of the Society of which the Lord Chancellor is Chairman, "admitting the principle of Dr. Bell's system to a certain extent, we are convinced that it is not sufficient, and *that the part which it leaves undone is of* THE MOST CONSEQUENCE *to the future habits of the pupil;*" which undone part is explained to be that which consists in the culture of the pupil's moral and intellectual nature. This is in sum and substance precisely what Mr. D. contends for; and, with submission to "Verax," we do not see that any more "specific proofs" could be desired of the inefficiency of the system.

The truth of Mr. D.'s *second* position turns on the somewhat notorious fact, that the poor have always had much more than the mere matter of poverty, or any thing necessarily arising out of it, to contend against in this country. They have had to bear up against a constant usurpation of their rights by the rich; against many severe restrictions from which the rich have remained free; against heavier taxes and imposts than the rich; against a multitude of difficulties and hardships, purposely or accidentally devised for their oppression by the rich—in a word they have not had "those *equal* opportunities of gaining knowledge and *applying it*," which Mr. D. states with truth to be the "born right of all men." Every page of our books of law and practice—every line of our fiscal regulations—every word of every official Report extant on the state of the people and the management of their institutions, bears incontestible evidence of these facts. Let him who doubts the truth all this only devote an hour or two to the perusal of the Reports of the Education Commission, and observe how

ample the funds are which have been bequeathed by benevolent and charitable individuals for the education of the poor of this country, and the help of poor scholars in their upward struggle through life, and yet how uniformly the rich have contrived to divert these funds to their own exclusive use, and to render them of no advantage whatever to the poor. Had these funds been but faithfully administered, the necessity which produced those defective institutions called National Schools would never have existed; and neither Grammar Schools nor Universities would have been, as they are now, like so many game-preserves, kept up for the pleasure and advantage of the rich and powerful alone. Or, if the doubter be one who cares less about the facilities to advancement afforded by Harrow or Cambridge, than about the opportunities which exist of getting on in the world in virtue of mechanical genius, let him turn to the late Report on the Patent Laws, and mark what difficulties are opposed to the *poor* inventor in every attempt to secure for himself a remunerative share of the profits of his inventions. The fact, that so enormous a tax as £300 and upwards is imposed on every new invention for which a patent is sought—no matter what the worth of the invention may be, whether £100 or £100,000—no matter what the means of the inventor, whether twenty pence or twenty pounds a day—ought of itself to be sufficient to satisfy every reflecting person that the influence under which such things are, must be an influence deeply adverse to the rights and interests of poor people. It is well remarked, in an excellent article on Dr. Chalmers's Political Economy, in the last number of the *Edinburgh Review*:—"Education will do a good deal, but we deny that it is omnipotent. Exclusive altogether of the state of education, there are many circumstances that powerfully influence the condition of society; that may, on the one hand, render the situation of the labouring classes tolerably prosperous, even though education be in a great measure neglected; and that may, on the other hand, reduce the best-educated people to a very depressed condition." Among the "many circumstances" here alluded to, there can be no doubt of the right to a foremost place, of every circumstance by which wealth is more favoured than poverty, or the productive powers of the community impeded. To put fetters on talent or industry is as wise (to say nothing of the oppression of the thing) as it would be to attach a drag to a high-mettled racer, or to stop up the nostrils of a pointer.

The best—indeed, the only—way of bringing about such an *equal* dispensation of favour to all classes as would make education of *equal* advantage to all—is doubtless still to promote education. Here we think Mr. Downing's "brother mechanic," Mr. Potts, has by far the best of the argument. We cannot bring ourselves to look on the prospects of the working classes so despairingly as Mr. D. seems to do; and entertain, on the contrary, strong hopes of relief—if not of entire justice—through that greater attention of mechanics to their "political duties and rights" which Mr. P. recommends, and also through the more correct notions which are beginning to prevail among the higher classes with respect to the foundations of true dignity and honour.

Mr. Potts imputes to Lord Brougham certain sinister intentions in his encouragement of Mechanics' Institutions. We think—nay, we *know*—these imputations to be entirely unfounded; but we give publicity to them because we believe they are common, as Mr. P. states, to the great body of London mechanics, and because it is important that his Lordship should not be left in ignorance of so prevailing an impression. If Lord B. would further know how this impression has arisen, he may consult what has been said in this work of the different one-sided treatises sent forth under his Lordship's auspices, in which every "Right of Industry" has been treated of at large, save the right of industry to—*fair play.*

ON FINDING THE CONTENTS OF PLANE TRIANGLES.

Sir,—When a person offers to the attention of the world any thing new, be it book or instrument, I conclude that it is always open to observation; therefore, it was I noticed A.'s instrument for "finding the contents of plane triangles," described in p. 153 of your last volume. But I beg leave to say, I was not aware that any of my observations amounted to "a splenetic attack," as A. pleases to call my letter; at least it was not my intention

that they should. At all events, I could not help making them, especially as it then appeared to me—and I see no reason yet to alter my opinion—that A.'s instrument is nearly useless, as it will (according to his own account) only give a result "*near enough* for most practical purposes." Now, Sir, that *near enough* must be allowed to be a matter of opinion, and to depend on circumstances, especially the value of the article measured. The want of accuracy noticed in my last letter, in the example selected by A., amounts to a unit and three tenths, which I deem an important deviation from a true result; yet he thinks it *near enough*. If I were to agree for the sale of the fee-simple of a parcel of land forming such a triangle at any given rate, say £100 per acre, and were to be set down by A.'s calculation, I should not think it *quite near enough*, as I should thereby be receiving £131 less than if he had duly appreciated the value of the second and third places of decimals of the half perpendicular. However, it now appears that A. contents himself with his instrument being "at any rate a good check upon the long operation by figures," and goes on to say, "that it needs but little to see how the construction may be simplified, by detaching its parts and having them of pasteboard, &c." He allows, therefore, it requires simplification; and that may be better accomplished "by detaching its parts," (as he proposes) then throwing away the *graduated board* and *two* of the scales, and retaining the third. The instrument thus *simplified* may be, I will undertake to say without fear of contradiction, used to as much advantage as before such *improvement;* and, according to the ideas of accuracy expressed by A., might "be of use in a very especial manner" to himself and the schoolmaster, but certainly not to the land-surveyor in the least, in either shape, as he always takes his dimensions in chains and links, noting them in his field-book, apparently as whole numbers, which, however, are virtually and in reality chains with (never less than) two places of decimals, and he always brings out his results to five places of decimals.

I remain, Sir, your's respectfully,

TEMPORA.

Kentish Town, October 8, 1832.

CONSTRUCTION OF CHIMNEYS.

SIR,—I concluded my last by stating that "more data, obtained from actual experiments scientifically made, are absolutely requisite before any just conclusions can be drawn" respecting the construction of chimneys. I fear, however, unless some abler pen than mine be engaged in soliciting the requisite degree of attention to this subject, that a long time will elapse before a sufficient number of facts are obtained which can be relied upon,—while, it may be, many individuals will continue, as heretofore, making expensive trials without any satisfactory or useful results to themselves or the public. As smoky days are now arrived, perhaps some will have their attention forcibly directed to this *thrice* repeated call, and thus be induced to come forward to assist in the formation of a plan for the combination of all efforts for thoroughly investigating the causes of smoky chimneys, and in ascertaining the means of avoiding them. By examining the shapes of a great number of existing chimneys, and correctly ascertaining their effects, a species of evidence may be procured; but it will, I think, be only by doing and undoing, and altering, that facts to be depended on will be discovered.

It is my opinion, which has hot been hastily formed, that many chimneys smoke from their "*well drawn-in gathering wings.*" The truth of this can of course only be proved by repeated experiments.

C. D. S.

GEORGE'S DOME DIAL.

Sir,—I observe in your scientific and truly valuable Magazine, for the 17th inst., an article on the erection of domes for cottages, without centre pieces. I am not going to discuss the propriety of dispensing with the latter, but to suggest the expediency of adding, *after* the dome is finished, a dome dial. I propose that it should consist of a piece of circular ground glass, on the inside of which is to be painted the hour figures, and that a glass rod should project through the centre, being neatly fastened within. The sun, when shining, would of course mark off the time.

Yours, &c., T. W. GEORGE.

7, Tarling-street, St. George's East,
November 22, 1832.

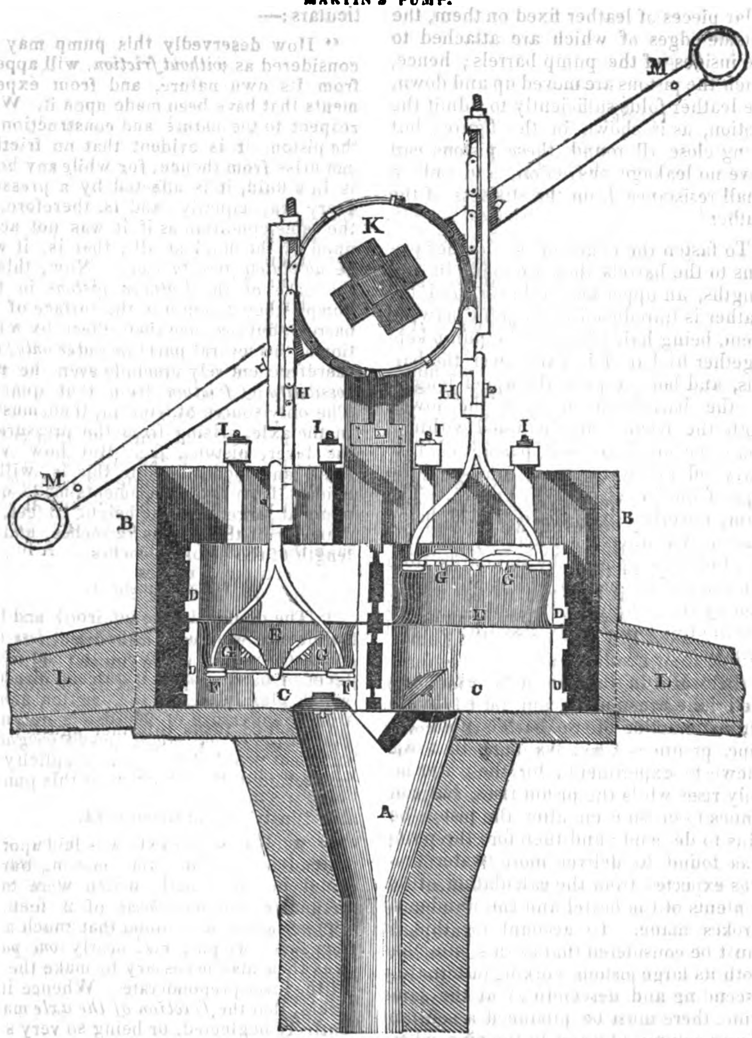
P. S.—In No. 1. Vol. 1, of this Maga-

zine, you were pleased to dub me a *Clockmaker*, but upon reference, you will find that my connexion with the markers of minutes in that case, as in this, is only in the *light* way.

PRETENDED OBSERVATIONS.

We have received a long and very angry letter on the subject of our remarks respecting the cometary calculations of the Useful Knowledge Society, from "A Member of the Society," to which we think sufficient justice will be done by stating that it amounts in sum and substance to this—that there are as good astronomers in the Society as out of it. The more the shame say we, that a Society so well provided with astronomical talent should have blundered so often and so egregiously, when such talent was the thing in request. Witness their Almanac, their Companion to the Almanac, and now their Penny Help to a Knowledge of the Heavens! The truth of the matter, however, we take to be, that the "distinguished astronomers" who belong to the Society, (and that there are such it becomes us not to dispute, when we see the names of so many distinguished F.R.A.S. on the list,) never trouble their heads about what goes forth to the world in the Society's name, but leave its astronomical articles to be got up, as most of the Society's other commodities are got up, by hackney compilers or professional smatterers. Now, it is precisely men of this stamp—men without any solid reputation to lose, and whose sole care is to seem passably well informed—who are the most likely to be seduced into that species of falsification of which we consider the late "cometary calculations" to be notable examples. It is so easy a thing to say that one has calculated this or that, and found the result to be a figure or two less or more than *other* calculators have represented it to be, and all this looks so like really knowing something of the matter, that he must be a *rara avis* among hacks and prigs who could resist the temptation. If you remark to a pretender of this sort that his calculation of the return of a comet or an eclipse differs to the extent of a day or an hour from that of an Airy or an Arago, he will tell you with an air of the greatest candour imaginable, that it is by no means wonderful there should be such discrepancies in calculations so immense, and involving so many disturbing circumstances, and that the real wonder is that the two results should be so nearly alike! He is of what Mr. Babbage calls the *order of trimmers*, (Decline of Science, p. 178,) one whose object is "to gain a reputation for extreme accuracy in making observations, but who, from respect for truth or from a prudent foresight, does not distort the position of the fact he gets from nature," and whom it is, therefore, always difficult to convict of downright mendacity. He is content to differ merely, and takes for his charter of protection the old saw, that "*Doctors* differ." The *trimmers*, though a very pestilent race of *pseudo-observers*, are not, after all, half so bad as the *forgers*. A trimmer, though he may raise a question about the precise moment when a comet or eclipse will make its appearance, never ventures to dispute its coming altogether: he has ambition, but it does not go the length of changing for his sake the order of the heavens! A forger, on the contrary, makes no scruple about mapping the heavens according to his *own* fancy: he can see comets where nobody else sees them, and discern traces of fortification in the moon! He lies boldly, from a notion that he runs no risk of detection (for a time, at least,) unless the one eye turns informer against the other. Science has its tests, however, by which even the most artful of these lying braggarts may be unmasked. A remarkable illustration of this is furnished by the case of the Chevalier D'Angos, who pretended that he had seen a second comet in 1784, and published a very methodical series of observations upon it. "They were long suspected," says Mr. Babbage, "to be a forgery, and were at length proved to be so by the calculations and reasonings of Encke. The pretended observations did not accord among each other in giving any possible orbit. But M. Encke detected an orbit belonging to some of the observations, from which he found that all the rest might be almost precisely deduced, provided a mistake of a unit in the index of a logarithm of the radius Vector were supposed to have been made in all the rest of the calculations."

MARTIN'S PUMP.



Sir,—The frictionless pump of Mr. Benjamin Martin having lately excited considerable interest, in consequence of its having been re-patented by Mr. Shalders—and having been more than once referred to in your pages, I am induced to send for your insertion the following description, which cannot be made too public.

In the above sectional drawing, A is the suction or feed pipe conducting the water up to the pumps, where it is enlarged to communicate with the two barrels D D, through the valves C C in the bottom. E E are the pistons, with double valves in them G G; they are not, like other pistons, fitted to slide in the barrels, but are simply brass rings, in

which the valves are fitted, and being smaller than the barrels, have large circular pieces of leather fixed on them, the outside edges of which are attached to the insides of the pump barrels; hence, when the pistons are moved up and down, the leather folds sufficiently to admit the motion, as is shown in the figure; but being close all round, these pistons can have no leakage or friction, and only a small resistance from the stiffness of the leather.

To fasten the edges of the leather pistons to the barrels, they are made in two lengths, an upper and a lower, and the leather is introduced in the joint between them, being half fast, and the pump kept together by bars I I, fixed over the barrels, and bolts to press the upper lengths of the barrels down upon the lower. Both the barrels are included within a box or cistern B B, with passages L L to carry off the water as it runs over the tops of the barrels into the cistern. The pump is worked by piston-rods H H, being united by chains to a wheel K, the axle of which is supported by standards from the sides of the cistern, and is put in motion by the double lever M, at the end of which cross-handles are fixed for several men to work at once.

Mr. Martin's pump acts extremely well: the constant stream raised by the alternate action of two barrels upon one pipe, produces an advantage that was shewn by experiment; for the water not only rises while the piston rises, but continues to do so even after the piston begins to descend; and therefore the pump was found to deliver more water than was expected from the calculation of the contents of the barrel and the number of strokes made. To account for this, it must be considered that as this pump has both its large pistons working (alternately ascending and descending) at the same time, there must be produced a constant rising column of water in the pipe, whose velocity through a bore of five inches, to supply the barrels of twelve inches diameter each, must be so great, that it cannot be checked or stopped at once, or upon the first descent of the piston; and therefore a surplus of water is produced.

The above description is taken from Nicholson's Operative Mechanic; the drawing is reduced from the plate in Mr. Martin's pamphlet,* from which I have also extracted the following further particulars:—

"How deservedly this pump may be considered as *without friction*, will appear from its own nature, and from experiments that have been made upon it. With respect to the nature and construction of the piston, it is evident that no friction can arise from thence, for while any body is in a fluid, it is affected by a pressure every way equally, and is, therefore, in the same condition as if it was not acted upon by the fluid at all; that is, it will be *absolutely free to move*. Now, this is the case of the *leathern pistons* in this pump; they touch not the surface of the barrels, but produce their effect by a motion of the several parts *in water only*, and therefore entirely preclude even the *very possibility of friction* from that quarter. The only source of friction, then, must be in the axle, arising from the pressure of the lever, pistons, &c. But how very small and inconsiderable this is, will be evident from two experiments made on a pump at large, viz. the height 16 feet, the diameter of the pistons 12 inches, and the length of the stroke 9 inches.

"*Experiment I.*

"The double lever (of iron) and both its pistons weighed 178lbs., and *less than one pound* weight laid upon the end of the lever or handle, made it descend directly; which plainly shows the friction arising from the pressure of 200lbs. is not more than equal to *one single pound weight;* a sufficient proof of the great simplicity and perfection of the structure of this pump.

"*Experiment II.*

"After this, the axle was laid upon the surface of perpendicular moving bars of 12 inches in length, which were tantamount to *friction-wheels* of 2 feet diameter; and it was found that much about the same weight, viz. nearly *one pound*, was then also necessary to make the end of the lever preponderate. Whence it appears, that the *friction of the axle* may be entirely neglected, or being so very small may be *esteemed as nothing*."

"Long after this pump was erected, and its effects publicly shown, it was objected by some that the *invention was not new;* for it could be proved, that years

* The Principles of Pump-work illustrated, and applied in the Construction of a New Pump without Friction, or Loss of Time, or Water, in Working. Humbly proposed for the Service of the British Marine, with the privilege of His Majesty's Royal Letters Patent. By Benjamin Martin, London, 1770.

before, pumps had been made with *two barrels upon one pipe;* and also that leather had been applied to a piston for raising water without friction before now. To all this I answer:—1. That I had never heard of any such construction of *two barrels upon one pipe*, when I made mine. 2. That, upon inquiry, I find no such application of the barrels to the pipe in them as appears in mine, where the course of the water from the pipe is *directly* into each barrel; but in them it is very oblique, and the force of the water must be greatly broke. 3. None of these double-barrelled pumps have pistons, like those in mine, *without friction.* 4. The leathern piston above mentioned was applied to a *single pump*, and not in a *double one*, as in mine. 5. This leather piston was of a different form from mine, and admitted of but a very *short stroke.* 6. Not only the construction or application of the parts of this pump is very different from that of all others, and their essential defects thereby removed; but it is attended with many *circumstantial advantages*, which cannot fail of recommending it to all who have occasion for a machineto raise water.

"This pump may be made of any size; and constructed with an air-vessel, as in the common *stream engine* for putting out fire; may be wrought with *men, water, wind, horses*, &c., for all the purposes of raising water to supply reservoirs, extinguish fires, water gardens, evacuate ponds, &c.

"What has been said is, I presume, sufficient to convey an idea of this new patent pump to every sensible and intelligent reader; if not, such as have occasion for one may have any satisfaction they please by viewing the said pump constructed at large, and the effect or efficacy of its operation, at the PUMP MANUFACTORY in *White Hart-yard, Lower East Smithfield.*"

From the above statements it will appear that even Mr. Martin's claim to *originality* was disputed, and on comparing his description with the statements put forth by Mr. Shalders in your former volumes, the perfect identity of Martin's Frictionless Pump, and Shalders' Patent Gravitating Expressing Fountains—as they are bombastically and absurdly named—will be at once evident. And it is clear that had Mr. Shalders lived and brought out his ugly-cognomened bantling during the term of Mr. Martin's patent, which strictly forbids "any person or persons, either directly or indirectly, to make, use, put in practice the said invention, *or any part thereof*, nor in any wise counterfeit, imitate, or resemble the same, nor shall make, or cause to be made, any *addition thereunto*, or *substraction from the same*, whereby to pretend himself or themselves the inventor or inventors, devisor or devisors thereof," he would have been convicted of an infringement of the patent-right.

It follows, therefore, that any person feeling disposed to make these pumps in *either* of the three kingdoms, is at perfect liberty to do so, without asking—much less purchasing—Mr. Shalders' permission.

Mr. Hebert, the talented editor of the Register of Patent Inventions, was perfectly right in observing, "This *new invention* is one of the *oldest* contrivances we ever met with in the specification of a patent."—"The patentee has, we hope, found it to answer his purpose, and we dare say has felt infinite satisfaction in his discovery; but *in attempting to secure to himself*, by patent-right, the exclusive privilege of using the machine, we fear he has '*expressed*' more money out of his pocket than will ever '*gravitate*' into it again from the same cause."

These pumps are not altogether meritless, although their good qualities have been most extravagantly overrated, both by their former and last patentee. They are not calculated for useful application on ship-board—nathless the certificates *twice* inserted in the Mech. Mag.; but for domestic purposes, with *short lifts*, they may, doubtless, frequently be used with advantage. Their application to the purpose of a fire-engine is proposed by the present maker, as it was by the original inventor: for this purpose, however, they are totally unfit. It is well known to all who are acquainted with the science of hydraulics, that two pumps of equal dimensions will be of equal powers although of different construction, except a difference of friction should exist; and that pump in which friction is a minimum will do the most work with a given power; and their respective *value* will be determined by comparing their first cost, effective power, and durability.

From the foregoing experiments, it is shown that Mr. Martin succeeded in reducing friction to a very small and insignificant quantity. Nothing less than its

total annihilation, therefore, will serve to constitute an *improvement* on the part of Mr. Shalders—and this I well know he has not accomplished. To form a correct estimate of the relative powers of the "fountain," and other pumps, it would be necessary to institute a series of experiments, in which care should be taken that all the circumstances (save and except the distinct peculiarity of form) should be similar. Nothing can be more unfair than the inferences that have been drawn from trials made between old pumps with worn out barrels, harsh piston leathers, and contracted waterways, and one of the more advantageously proportioned and more favourably circumstanced fountain pumps.

The very circumstance of these pumps having been made and used fifty years ago, and since been laid aside, is a pretty good reason for believing that they did not realise the permanent advantages held out by those who made them *to sell*.

Since this communication was begun, the letter of Mr. Robert Mallett has appeared in your 482nd number, which contains a very pretty *exposé* of the extent to which trickery has been pushed by the proprietor of the "Gravitating expressing patent." The publication of the foregoing descriptions in your widely circulated pages, may probably, at this time, be of essential public service, by informing all persons what has already been done, and what they are at liberty to do again, if they please.

The only point on which I differ in opinion from Mr. Mallett, is, that I consider Mr. Shalder's pump is NO *go!* I shall have much pleasure in learning the result of Mr. Mallett's promised experiments, and remain,

Very respectfully yours,
W. BADDELEY.

London, Nov. 9, 1832.

ON THE BURSTING OF STEAM-BOILERS, AND MR. PERKINS'S NEW LAW OF NATURE.

Sir,—In the Mech. Mag., for March 24, 1832, there is a paper by "Philo-Mechanicus," animadverting in a somewhat lofty and bombastic strain on a supposed want of due respect on my part towards Mr. Perkins, and my hypothesis of the cause of steam-engine boilers exploding. The writer begins by stating "that he knows nothing of Mr. Perkins;" in answer to which, I beg to suggest that such being the case, it would have been no more than discreet in him to leave the discussion of Mr. P.'s merits to those who are competent to the task. He next says, that if I "must run a tilt, it ought to have been *with* the printer, who *seems* to have *erroneously* substituted the words *in density*, for *in intensity*." Now, assuming that the printer committed an error (of which fact I am not satisfied), how was I to discover it? I can assure him, that although some of my countrymen are said to have got the second sight, I am unfortunately not so gifted. The experiments of Watt and Wolfe prove beyond a doubt that steam, like other bodies, expands by heat, and consequently is increased in intensity; for steam that will balance any given pressure on the safety-valve, will, after expanding to as many volumes, be still equal to the pressure of the atmosphere, *provided the same temperature is kept up.* It is not a little remarkable, that Gay Lussac, whom your correspondent so confidently brings forward in support of his reasoning, should appear in the same number as an evidence against him. It is true that, if we suppose a boiler to be full of steam of the ordinary density in low pressure engines, and that that steam were suddenly decomposed, the hydrogen produced by such decomposition would certainly open the safety valve, and partially escape; but such a case as is here supposed, never can be realised. To enable your readers to understand my views on the formation of hydrogen, and the consequent explosion of boilers, I will suppose that the water in the boiler is so low as to leave part of the flues dry: I think no one will deny that, under such circumstances (if the fire is kept up) the flues will get red-hot; and it is equally certain that the quantity of steam produced is proportional to the metallic surface with which the water is in contact. Under these circumstances it will be found that the steam is not formed in sufficient quantity to give the engine her full speed. The fire is then urged on, in hopes to mend the matter, but still the engine refuses to perform. Something is suspected to be amiss: the engine stops, or is stopped; the pressure is removed from the safety-valve, but the valve remains shut; the engineer forces it open, and an explosion takes place. The above agrees with an account of an

explosion I have somewhere read of, but where I do not now recollect. I remember, however, that the difficulty in opening the valve, and also the explosion which took place on its being opened, was attributed to the agency of electricity. Now, according to my hypothesis, as soon as the flues began to get red hot, hydrogen would begin to form; but while the engine continued working, the hydrogen would escape along with the steam. As hydrogen, however, is not a condensible vapour, a vacuum would soon cease to be formed, and consequently the engine must stop. That your readers may know that I have not founded my ideas on mere hypothesis, I must tell them that I have on more than one occasion smelt hydrogen very strongly issuing from the joinings of boilers.

"Philo-Mechanicus" says—"May we not suppose that the same intense heat which would decompose steam would also decompose the unguent which lubricates the valve, and thus operates as a flux to the solder, or at least to agglutinate it to its bed? This of itself would cause an explosion." In reply, I would say, that this of itself proves the ignorance of the writer, for neither unguent nor solder has any place about a safety valve.

He is little less erroneous in stating that the latent heat of hydrogen is "nineteen to one above that of steam." The latent heat of hydrogen is to that of steam of the same temperature only as three to one.

I shall conclude this paper with a few observations on Mr. Perkins's supposed new Law of Nature.

Mr. Perkins is certainly one of the most unfortunate aspirants for fame that ever lived. Almost all his discoveries and inventions are either found useless and abandoned, or shown to be the inventions or discoveries of others. *The New Law of Nature*, is of the latter class. So far is this *New Law of Nature* from being new, that it was known to all men of science some forty or fifty years ago; though certainly not in connexion with steam, but with another element. Muschenbroeck and Leidenfrost appear to have been the first who noticed this *New Law of Nature*; but by far the most extensive series of experiments on the subject were made by M. de Saussure, who first verified a remark of Volta's, that the electricity produced by the chemical processes of Lavoisier and La Place, and by the evaporation of water, was constantly resinous. Saussure then examined the electrical excitation produced by evaporation carried on in vessels of different temperatures and of differeut metals; *estimating, at the same time, the rate of evaporation by the time required for the total dissipation of given quantities of the fluids employed.* He proved the assertion made by Muschenbroeck, on the authority of Leidenfrost, that the hotter an iron vessel might be made, the more slowly would the process of evaporation be effected. There was, however, this difference, that if given quantities of water, ether, or alcohol were projected successively into an iron crucible, raised to nearly a white heat, the first such quantity would be dissipated with great rapidity; the second would require rather longer time; and so on for some more projections; but at length a point or degree of heat might be found in the vessel, such as to produce the slowest possible evaporation; and that, if further successive projections were made as the crucible still continued to cool, the rate of evaporation again increased; until, from absolute want of heat the rate again diminished, and finally, the power of vaporising the fluid would of course be lost.

Since writing the above, I have taken another look at Mr. Perkins's paper and I feel at a loss as to which of the two discoveries he considers as a *New Law of Nature*,—the discovery of the evaporating point, or the supposed circulation of the water in a particular kind of boiler. But be that as it may, I have shown that he has no claim to the first; and your acute correspondent, Trebor Valentine, has shown that he has no claim to the second.

I remain, dear Sir,

Your very obedient servant,

A. Mackinnon.

THE REAL CAPABILITIES OF STEAM-CARRIAGES ON COMMON ROADS.

Sir,—The doubts and sneers that have been cast upon steam-travelling on common roads, have, I believe been principally caused by the exaggerated statements of over-sanguine inventors. The

disease is not cured because the patient deceives the doctors.

I have laboured hard for many years at the theory and practice of locomotion, and find I am somewhat wiser for my trouble; but being wholly unassisted, my progress is necessarily slow. I consider all the noted steam-carriages that have started have been over driven, and will knock up in consequence. My theory and practice show me that a steam-horse will do just as much as a living horse. It so happens that the working pace of steam (or piston rate) is about the working rate of a horse at his best; namely, $2\frac{1}{4}$ or $2\frac{1}{2}$ miles an hour, and at this rate either horse will draw a ton on common roads, good and bad, up hill and down for a day together, and this is a fair horse's work.

Now if a *real* 8 horse-power engine be made, and its total weight be 4 tons, it will draw itself and 4 tons of goods at the rate of $2\frac{1}{2}$ miles an hour. At 5 miles an hour it will draw only itself, and at 10 miles an hour it will only exert a power able to draw half of its own weight, through all roads; for locomotive machinery follows the laws of common machinery,—if the speed be increased the load must be lessened. 'Tis true this 8 horse engine may be forced to much higher exertion, at the risk of speedy destruction.

It may be urged that coach horses do much more in proportion to this. True; but they can only work a few hours each day. Let our steam horses be considered as perpetual coach horses (which is allowing a great strain on the machinery, compared with stationary machinery,) and then how will the account stand? Four horses can take a stage coach of 2 tons at 8 miles an hour; consequently a steam-engine of 8 horses power, to equal this, must weigh of itself only 2 tons, and have a load of 2 tons, being half a ton for each horse. But if the required speed be 16 miles an hour, then the engine must weigh only 1 ton and draw another ton. Therefore, *Query*,—Can a full 8 horse-power engine be made, capable of continual work, that shall weigh only 1 ton? If so, 16 miles an hour can be maintained, and if not, the speed must be reduced as the weight is increased; and even in this parallel, where hills or bad roads occur that require the living horses to drop their speed to a walk, and then do their best, the steam-engine (at the 8 miles an hour pace) must act on a lever nearly equal to the radius of the propelling wheels. This is a simple calculation, and involves the true capabilities of steam-carriages on common roads.

Theoretically, I think Mr. Walter Hancock's boiler the best, having the greatest heating surface with the least weight; but I imagine thin metal heated by blast will not wear to pay charges. In fine, I fear at present a locomotive engine cannot be made substantially for regular economical work under half a ton weight per horse power; and if so, great speed cannot be expected, and long levers must be used in difficulties, which is only coming round again to my old story. I understand Mr. Hancock has been fitting up his carriages with longer leverage.

Has it ever been well considered, that in stage coaches the first mover (the horses) goes at the same rate as the vehicle? The power and resistance work an equi-armed lever, namely, the spokes of the wheels; whilst in steam-carriages, *the first mover* (*the pistons*) *never exceeds* $2\frac{1}{2}$ *miles an hour*, yet the vehicle is wanted to go 20 miles an hour: consequently, 8 times the power are required to do it, that would be required at $2\frac{1}{2}$ miles an hour.

He who builds an engine to propel a common stage waggon, will, in my opinion, soonest find his reward; and even here two steam horses will have to be maintained to do the work of one living horse, by reason of the weight of the engine, fuel, water, &c.—Yours,

SAXULA.

November 5, 1832.

PADDLE-WHEELS ON THE SCULLING PRINCIPLE.

Sir,—About two years since I sent a model of a steam-boat to the Philosophical Society of the Mauritius, propelled by paddle-wheels, on the principle of the vanes of a windmill, which is nothing more than the principle of sculling, but having the advantage of being placed mathematically correct, and revolving in a circle, which draws the vessel in the direct line of the spindle or axle on which it turns. In the gallery of Practical Science and Works of Art, Adelaide-street, there are paddles exhibited

on this principle, which are said to answer better than the common paddles; but I think they are not applied in the most advantageous position, being placed on the side of the vessel. In my model I placed them to the stem and stern of the vessel, *totally* under the water, and turned them by a spindle connected to the power inside. The advantages of this I consider are as follows:—

1st—It matters little how much the vessel is in or out of the water.

2d—Being under the water, the paddles are always acting, for when one extremity of the vessel is out of the water, the other is in; but now, when a vessel rolls, one paddle does not act from being too much immersed, and the other from being thrown out of the water; the necessary consequence of which is, that the vessel looses her speed.

3d—In a war steam-boat the paddles would not be exposed.

How the vessel is to be steered,—how leakage is to be prevented,—how the paddles when injured are to be unshipped and replaced, are all matters which may, I think, be easily provided for, if the principle is good. Perhaps some of your numerous correspondents would give their opinion on this subject.

I am, Sir, yours obediently,

JOHN POLE, Commander, R.N.

1, Furnival's-inn, October, 1832.

NEW PUBLICATIONS CONNECTED WITH THE ARTS AND SCIENCES.

The Almanacs for 1833—*Second Notice.*

Rogerson's Temporis Calendarium continues to evince a very commendable degree of care and accuracy in its astronomical calculations, and presents, in its Sunday Lesson Tables, and in the love of piety which distinguishes the reflections interspersed through its pages, peculiar claims to a continuance of the favour with which it is regarded by a respectable portion of the Dissenting interest

The British offers nothing new this year, and is, indeed, little else than a mere reprint of last year's almanac. We have the same Remarks on the Weather, *literatim et verbatim*, for 1833 as for 1832; so that it should seem the Useful Knowledge Society think there was great propriety, after all, in the course which Partridge used to pursue, according to the words put into his mouth by Swift: "As to foretelling the weather, we never meddle with that, but leave it to the printer, who takes it *out of any old almanac* as he thinks fit." We observe that the Society have settled that the eclipse of the sun, which is to take place on the 17th of July next, is to "begin 4h. 11m. A. M.," while all the other calculations which we have seen make the beginning of the eclipse 5h. 3m. 42s. or 5h. 4m. Would it not have been as well to make the spectacle an hour later instead of earlier? Four o'clock is early to rise! The Society have been also pleased to reduce the magnitude of the eclipse from 8° 49′ to 8° 8′. But this is of less consequence; lucky they did not obliterate it altogether! The compilers of the *British* seem to think that differences of seconds, minutes, and even hours, are of no consequence whatever in astronomical calculations! Among the notices for the month of January we meet with a still more ludicrous illustration of this new view of the matter. The reader is there informed that Gemini will be on the meridian *about midnight*, ABOUT THE MIDDLE OF THE MONTH, as if the constellation occupied *only a moment* in culminating: whereas, from the first star in that constellation being upon the meridian, to its last star, an interval of more than 1h. 25m. elapses. So, again, from the astronomical information for February we learn that the constellation Ursa Major is on the meridian *about midnight*, NEAR THE MIDDLE OF THE MONTH; while, in truth, that constellation occupies more than 3h. 11m. in transiting the meridian. (The same ridiculous guess-sort of style pervades the Calendar.) The matter given under the head ASTRONOMICAL PHENOMENA exhibits altogether a very childish medley. For example, in the first column for January, the times of *Venus's* southing and setting are given for one day in the month; and that of *Saturn's* southing for one day. In February we are told the times of the southing and setting of *Venus* and *Jupiter* for one day. Why not for more than one day? and why are the other planets so capriciously neglected? For what class of readers, again, is the information in the second column intended? Would the *un*astronomical readers of the almanac be able to find and identify a single one of the fixed stars named, 24 Ophiu-

chi, 104 Tauri, &c , by the information there given? Assuredly not. What would a real practical astronomer give for 300 pages of such information? Not three farthings. For whose use, then, is it intended? Or is it meant to exhibit the semblance of science where the reality is so sparingly introduced? We should like to know which of all the astronomical Members of the *Superintending* Committee are answerable for these things. Mr. Lubbock, Mr. Sheepshanks, or Mr. Wrottesley? Some one of them, surely; for regard the matter how they may, the Members of the Committee must be considered as making themselves responsible —this, *at least*—for all the trash issued in the name of the Society, that falls under the respective departments of knowledge for which they have any name or reputation.—The Members of the Parliament now on the point of dissolution are given very fully; and a considerable space is thus occupied to no purpose which might have been filled up to great advantage, as in the *Englishman*, with the subdivisions of counties, and the places of election, according to the Reform Act. We shall be told, perhaps, that this information *may* be or *will* be given in the *Companion to the British Almanac;* but is not this admitting, that to make the *British* as useful as the *Englishman*, the purchaser must lay out three or four shillings more, and thus get the acknowledged deficiencies supplied? In the List of City Officers (p. 52) Alderman Garratt, who resigned two years ago, remains, and his successor, Sir Chapman Marshall, is omitted. How will such of the Committee as are freemen of the City make peace with their brother citizens for this mistake?

Dunn's Law and Commercial Daily Remembrancer is not strictly an almanac, as it wants the Calendar part, but is deserving of notice under the same head, on account of the great quantity of valuable *almanac-like* information which it contains, and its remarkable cheapness. A blank Diary of 130 8vo. pages, with 150 closely-printed pages to boot, of Tables, Abstracts, Lists, Observations, &c., is even in these days of farthing thrift, an amazing pennyworth. Among the original articles there are two eminently deserving of general attention—one on the Stamp Laws, and another on the Inhabited House-Duty, in which the inequality of their operation, as regards the rich and poor, is illustrated by a multitude of very striking facts, and commented upon with great spirit and ability.

Goldsmith's (waistcoat) almanac, tiny thing as it is, might make the compilers of the *British* blush for their astronomical puerilities. It gives the risings and settings of *all* the old planets for *three* days in each month; and every body (except perhaps a maker of *British* almanacs) can from thence very easily find the time of southing—as accurately at least as the Society's computers have assigned the southing of the constellations.

Rider's Merlin, the *Clerical Almanac*, and a whole flock of Sheet Almanacs, claim also some notice at our hands in return for the civility which has placed them on our table; but we have only room to add of them generally, that an endeavour to keep pace with the improving spirit of the age is discernible in all of them, though certainly not to the remarkable extent exhibited in the *Englishman's, and Tradesman's and Mechanic's* almanacs.

MR. HANCOCK'S STEAM-CARRIAGE.

Sir,—Although very unpleasant to enter into any controversy with an unknown correspondent, yet from a fear that the vanity of F. H. might lead him to believe that his letter is unanswerable, I take up my pen to reply to it in so far as I am concerned. In the communication which I formerly addressed to you I made certain statements relative to the superiority of Mr. Walter Hancock's inventions relative to steam-carriages. F. H. should disprove these statements, which he does not attempt; or he should not call me "another guess-sort-of-man," and blame me for being "so tenderly careful" of Mr. Hancock's reputation. That the slightest approbation of another party is "gall and wormwood" to me, I deny. Mr. Gurney's name was drawn into my letter from the necessity of replying to Dr. Lardner, who had in his "lectures" represented Mr. G.'s method of raising steam as superior to that of any one else. I adopted a course which I humbly conceive F. H. should have adopted in criticising my letter—I gave the subject, as far as my abilities would allow, a scientific sifting.

F. H. doubts that my letter emanated from disinterested friendship to Mr. Hancock: he has my name and address, and may inquire, if he wishes, for satisfaction

on this point. I rather think the "gall and wormwood" is on the other side; but as I have not the means of acquainting myself with the occupations of F. H., I shall decline any farther controversy with him in his anonymous shape.

With the greatest sorrow for his acquaintance that run its head against a post, I bid F. H. adieu, and

I am, Sir, most respectfully yours,
WM. VERE.

Stratford, Essex, November 24, 1832.

LOCOMOTIVE ENGINES —IMPORTANT DECISION.

In the case of the King against the Proprietors of the Stockton and Darlington Railway, which has been repeatedly noticed in this journal, the Court of King's Bench gave its final judgment on Monday last in favour of the defendants. Mr. Justice Parke, who delivered the judgment, stated that the Court were of opinion that the Company had pleaded a good justification under their Act of Parliament; and that though certainly the locomotive engines used on the railway had been shown to be attended with considerable annoyance to travellers on the adjacent high-road, the Legislature might have intended that the smaller inconvenience should be submitted to for the sake of the greater good.

MISCELLANEOUS.

Temperature of England.—The mean temperature of London is about 2 deg. higher than that of the surrounding country; the difference exists chiefly in the night, and is greatest in winter, and least in spring. During the whole year, the mean temperature of England does not vary in different years more than four degrees and a half.

Steel Engravings.—A Mr. Percy Heath has discovered a mode of re-biting steel-plates, by which he can bring up to colour those tints which are usually considered incapable of profiting by that process. This method promises to be useful in restoring worn plates, or such as merit to be repaired.—*Athenæum.*

Continental Railways.—A railroad between the Weser and the Rhine is about to be commenced; it has received the sanction of the King and States of Hanover, and a company, supported by government, has been formed to carry it into effect. Several hundred shares of 500 thalers each, have been taken. The execution of this plan will be of great advantage to the trade of the North of Germany, particularly of Bremen. It is proposed to connect Lubec and Hamburgh by a railroad and steam-carriages. A steam-coach is now in construction at Copenhagen, which is to run on the new road between Kiel and Altona.—*Times.*

Fiery Metors.—The Federal de Genève of Nov. 20, contains an account by Professor Gautier, of some very remarkable meteorological phenomena which were witnessed there on the night of the 12th and 13th of November. The Professor thinks that they did not arise from Aurora Borealis, but belonged to that class of fiery meteors commonly called falling stars or luminous globes. They were chiefly observed between three and six o'clock in the morning. A very great number of falling stars were first seen in all directions; then a smaller number of extremely bright luminous globes or points, throwing sufficient light to produce shadows, and spreading in their motion so as to present for some minutes beautiful streaks very like rockets. The colour was reddish, but some observers noticed occasionally pink and even blueish tints. There were at least four or five of those great meteors at different times, points of the compass, and directions. Some went winding about, others were subdivided into many rays, and all or several ended in a sort of indistinct and yellowish luminous cloud. There was no particular noise; the weather was mild for the season, with a light north-west wind; the sky was clear during the greater part of the observations; the barometer very low.

INTERIM NOTICES.

J. H. states that he is prevented from giving any explanation of his scheme for raising sunken ships (p. 127) in consequence of its being at present under the consideration of government; but that he has "taken the opinion of some scientific men, who consider the idea to be quite unique," and hopes "soon to be able to communicate the results of actual experiment."

Mr. Mich. Shipley, 28, Devonshire-place, Marylebone, having made some experiments on extracting oil from castor seeds, will be happy to communicate with "Castor" on the subject. Mr. S. states that he has reason to believe that the skins of the seed contain a rank poison.

"Vindex" has sent us a letter, the purport of which is to request a suspension of opinion on "F. H.'s" note on the Free Negro Colony of Liberia, until the Agent of the American Colonisation Society, Mr. Elliott Cresson, who is now on a tour through the North of England and Scotlaud, "can answer for himself, and render the antidote as diffusive as the poison." Vindex pledges himself that Mr. C "shall do so the moment the defamatory article is put into his hands."

Mr. Saul ought to know both us and our fiddle, better than to suppose what he supposes.

All that a certain esteemed friend says, in vindication of the "soothing" delights of tobacco, may be very true, and if he will be content to enjoy his pipe, without turning the puff into our face, he shall be welcome? We have never said anything to entitle us to the rival "championship" which he would confer upon us.

We shall endeavour to find room for Mr. Shalders' vindication in our next.

Many thanks to the friend who has sent us Mr. Milne's very interesting letter. It shall appear soon.

We shall be glad to hear from C. M., and to comply with the arrangement he proposes.

Communications received from Mr. Robson—Mr. Vere—T. M. B.—J. B. C.—F. M. S.—Mr. Dumbalton and brother carpenters—S.—Mr. Ashton.

Errata.—"In the representation of the blocks intended to assist in the method of building a dome without centering, (p. 108) the printer has inverted the position in which I placed them, which I fear may render the accompanying description somewhat obscure."—S. DOWNING.

Page 121, col. 2, l. 15 from the bottom, for "and" read "or".

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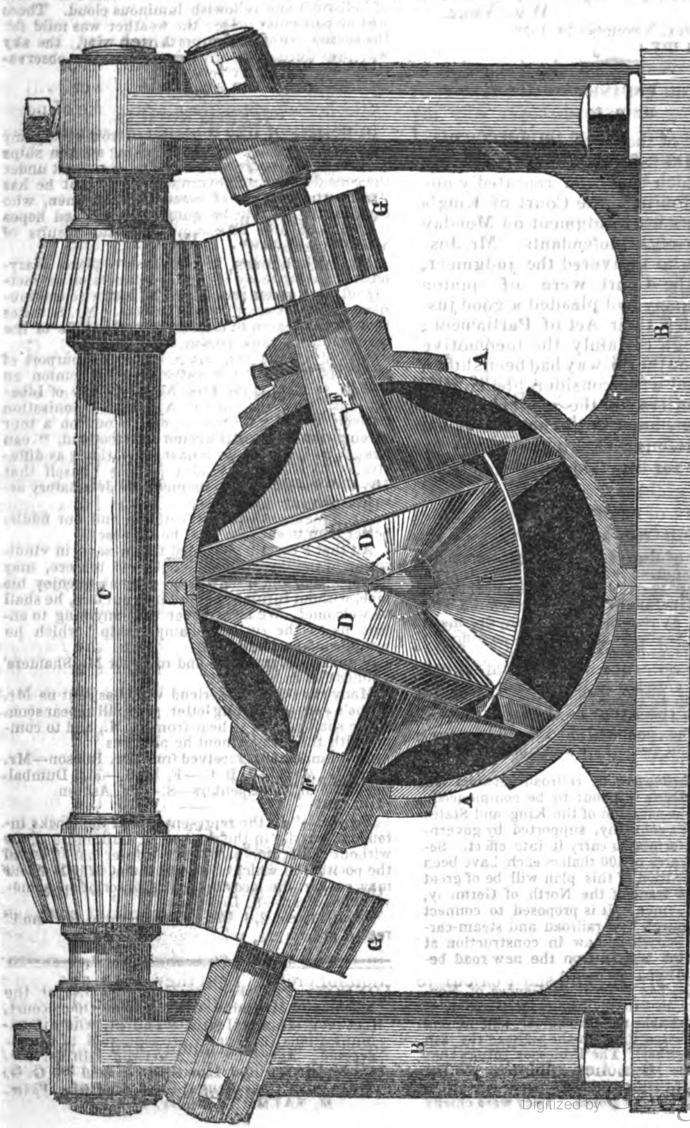
Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 487.] SATURDAY, DECEMBER 8, 1832. [Price 3d.

DESIGN FOR THE IMPROVEMENT OF ERICSSON'S STEAM AND WATER-WHEEL.



DESIGN FOR THE IMPROVEMENT OF ERICSSON'S STEAM AND WATER-WHEEL.

Sir,—Having been much interested by your description of Mr. Ericsson's new engine, and having carefully read the opinions of your correspondents on the subject, I beg, with your permission, to invite their criticism of the annexed modification, which appears to me to meet and overcome some of their objections. I wish it to be understood that I do not presume on my own judgment to offer it as an improvement on the invention of so eminent an engineer as Mr. Ericsson; but not being able to discover why my alterations would *not* be improvements, I appeal to your correspondents for their assistance.

The chief object which I proposed to myself was to avoid that grinding between the cone and plane which Mr. Busby makes his first objection, and which I think "Mechanicus" would find a more serious affair than he supposes. In order to avoid repetition, I have lettered my drawing in correspondence with the description of fig. 1 of the original as far as the shaft C. DD are two similar cones, fixed to the shafts FF, carrying the pinions GG. These cones are so placed that the sides in the upper half of the globe are always in contact. At the vertex of each cone there is a cup turned out to receive a portion of the small solid globe H. This globe is not fixed to either of the pistons I (only one of which can be seen in the figure), but allowed to revolve freely in its sockets, and should be of steel. The openings for the entrance and exit of steam, and all other parts unexplained, are intended to be the same as the original.

The advantages which I suppose such an arrangement would possess over that of the inventor, are an increased surface of piston, with a trifling decrease in the other moving surfaces on which the steam would act in a globe of the same dimensions; and an entire absence of grinding between D and D, for they are exactly similar in extent, and of a more convenient form, particularly for marine purposes. I have made my drawing to the same scale as Mr. E., and shall calculate its power in the same way. The engine represented presents to the action of the steam 20·67 inches; at its maximum the mean will be 16 inches, globular chamber 13 in diameter. An engine of three times the size would expose 144 square inches to the action of the steam, and the average distance performed by the piston would be 7·35 feet for each revolution, and if the engine made 180 revolutions in a minute, 1323 feet would be the journey. If steam at 45lbs. per inch were used, 6480 would be the constant force, which + 1323 = 8573640lbs. raised one foot per minute, which ÷ 33000 = 259 horse-power. Now, if we take off the odd 59 for friction, (which will be very much more than sufficient, according to your data,) the available power will be 200 horses, showing an increase of power in vessels of like dimensions equal to that of 80 horses. Surely this cannot be: there must be some reason why it would not answer, or so simple an alteration would have suggested itself to the ingenious inventor. Wishing him every possible success,

I remain, Mr. Editor,

Yours respectfully,

J. G.

Penzance, Nov. 14, 1832.

P. S.—Had not the length of my communication already exceeded its value, I should have sent a new arrangement for the slit packings, which I think would be acknowledged an improvement. Should this obtain a place, I will send it at some future time.—J. G.

THE FOREIGN QUARTERLY REVIEW ON STEAM TRAVELLING.

Sir,—In the last number of the *Foreign Quarterly Review*, there is an article on steam-carriages, evidently the production of a writer capable of taking a comprehensive view of the subject, however he may be out in some particulars. Notwithstanding its faults, it seems to me the most rational essay on the matter which has yet appeared—I should perhaps rather say, that I am yet aware of. The writer takes the same correct view that you yourself have done, of the absurdities which are talked about common road steamers, while contemplating them in their present condition as a speculation for profit. That they move, and move rapidly, is true, but the remark of the reviewer is correct, that "the enquiry is altogether one of economy and durability, rather than of possibility. Mr. Busby has given an account of the trial of Mr. Han-

cock's coach on the Brighton road, which I doubt not is correct: but how many days in succession will the coach perform the same, without repairs? Will it go through its work, without needing more proportionate repairs than a horse coach? If it will not, it is useless to bring it before the public. Neither puffing nor talking, nor newspaper fame, will realise the per centage which can alone make it practicable. Upon only one ground could such a system be defended, viz., the desire of exciting the public mind, by way of procuring funds to carry on the experiments which must still be gone through ere an approach to perfection can be accomplished. If the great stage proprietors feel an interest in bringing the project to bear, as I have understood is the case on the Liverpool road, funds will not be wanting; but even then, judging by all that has hitherto taken place, it must be the work of sounder heads and more reflecting minds than have as yet been engaged in it which will eventually ensure success. The reviewer in the *Foreign Quarterly* has justly criticised the quackery wherewith Doctor Lardner attempts to bolster up the failure, in a mercantile point of view, of Mr. Gurney's carriage. It may be said that he is severe, but truth ever should be so; and every individual who violates truth, more especially in matters in which the public at large are concerned, ought to be most unequivocally corrected, whether the violation be caused by the presumption of ignorant quackery, or of wilful and interested design. The unintentional errors of the unpretending should alone be treated with forbearing gentleness. The conscious ignorance of the humble man we sympathise with, but can only feel disgust at the quackery of an individual of the higher class, who affects to *know things* because he has become possessed of a vocabulary of *names*, which he has learned *by rote*.

The reviewer states that the wear and tear of the Manchester railroad, and the engines employed on it,—twenty-four of which are required in order to keep six in use while the others are repairing—amounts, jointly, to the sum of £35,000 per annum. I suppose this is correct, as he quotes their own accounts, which I have no means of verifying. Whether the sum be much or little, I have no means of judging, for want of data: it may be a small per centage or a very heavy one in their profits; or it may be more or less than the per centage of wear and tear on coaches and roads, where horses are the moving power; but it certainly is a proof of some radical defect, if twenty-four engines are kept to do the work of six. The reviewer states that the main defects in most of the locomotive engines, whether for the railroad or common road, are—

1. The imperfection of the boilers, which should be light, strong, and of great capacity for generating steam.

2. The imperfect mode in which the steam is conducted from the boiler to the cylinder, whereby much of the power is lost.

3. The imperfect shape of the cylinder itself, which should be short and wide, instead of long and narrow.

4. That the carriage should be suspended on springs, so constructed that nothing but the wheels and axles might be exposed to the jar of the unequal surfaces of the road. As the springs are at present constructed, they are inefficient, being little better than rigid masses of metal.

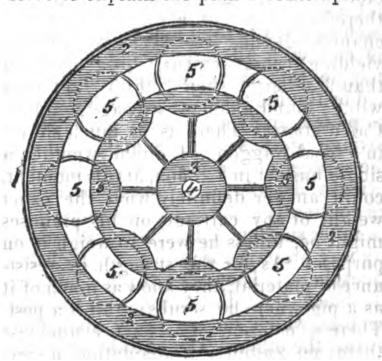
5. The inefficiency of all the means as yet adopted to regulate the speed of the engines, to make them always travel at the same pace, whether up hill or on level ground.

The general character of the paper displays ability on the part of the writer, but he is evidently no practical mechanic, or he would not have inserted the piece of highflying hyperbole in which he indulges on the subject of pleasure carriages. "One of the best London-made carriages is nearly perfect"!!! "What an exquisite structure is a modern carriage! how simple in appearance, how beautiful in its form, proportions, and position, yet how complex and intricate in its formation! What a combination are its wheels, tires, and axles, its pole, its perch, and its springs, body, box, cushions, steps, braces, belts, lamps, blinds, and bags, each individually a *chef-d'œuvre* of art; yet every one of these refinements * * * *" If your readers turn to the play of Hamlet, they will find the original from which this passage is parodied, beginning, "What a piece of work is man!" * * * * "And yet what to me is this quintessence of dust?" This savours of quackery, the sin of Doctor Lardner. One might really

almost suppose, from this puff direct, that the reviewer calculated on being asked to dinner by the guild of carriage constructors. It was not a bad idea, especially as the *Foreign Quarterly* circulates in foreign countries, to impress upon the subscribers that English carriages are of the "nothing like leather" class, but it would have been better to have omitted some of the technicalities extracted from Felton—not him of Buckingham memory, but him who compounded a sort of carriage-builder's price book, and displayed considerable ignorance in the art of drawing. The trash in which the reviewer indulges on this matter is sickening. "A life-time of study to understand a carriage!" What then would it require to understand a ship? A sailor once astonished a lady passenger, by informing her how very few ropes there were in a ship, but her astonishment was lessened when she understood that five out of six were duplicates: though the number was great, the names were few; and even thus in a coach, three parts out of four are duplicates. There are four wheels, four springs, four axles, four braces, &c. &c. "Ingenious competitors," "admirable artists," "nicely calculated and minutely adjusted proportions!" Can the reviewer seriously mean to set up the men of paint, putty, and gingerbread as superior in intellect to those who tread in the steps of Watt and Smeaton? If it be so, he has assuredly been born with a silver spoon in his mouth, and never been jostled by the crowd. Like many other people, he has taken carriages and carriage-builders for granted, and never exercised his judgment upon them. If there be one set of manufacturing mechanics, dealing in expensive articles yielding large returns, more ignorant than another, I should think that they will be found amongst carriage builders. Calculation! There is as much shown in a coal waggon. I doubt whether a single builder in London, at this moment, could answer definitely what the exact weight of any carriage on his premises might be, unless he were to weigh it on purpose. As for the strength or resistance of material, they know as much of it as a pig when he scrubs against a post. There is not one jot of science amongst them, no readiness of adaptation, no fertility of resource, no education as to the principles of mechanics. They are mere followers in a beaten track, copying that which has been done before, and slightly varying according to caprice. To use a scientific term would be to dumbfound them, and they would perchance ask in what foreign country it might be found? It is true that in the working gear—the springs and axles—the proper proportion of parts will mostly be found; but such will be the case also in coal waggons and brewers' drays. In neither case have they been got at by calculation, but by making them abundantly heavy in the first instance, and then lightening them gradually down, till they failed from weakness, when a little more additional strength settled the point. It is curious enough, that by an experiment on coal waggons, drays, and every variety of pleasure carriage, axles of steam boats, and fly wheels of engines, the relative proportion was found alike in each and all, as compared with the weight and momentum they had to sustain. As mechanics, carriage builders—I speak not of the working men, but of the directors and planners—are below contempt. Let any intelligent man, who has ever given them work to execute, say whether this be not the fact. Amongst the workmen there is much skilled labour, in which a correct vision is required, and this of course is highly paid for,—just as a joiner, who makes a geometric stair-rail, earns five times as much as the ordinary carpenter who merely frames square-pannelled doors; or as the engineer, who can file true and fit up air-tight joint-work, gets more money than a mere chipper of wheel sand pinions. Highly-skilled labour is never in abundance. Out of twenty who attempt, only one or two succeed, and, like first-rate actors, they get large wages. But the business of the directive carriage builder is not of a mechanical nature. There has been no alteration in the mechanism of carriages for many years past; and that it is still imperfect enough, any one may satisfy himself who looks at the barbarous motion produced by the four upright or circular springs from which the body is suspended. The last alteration was the interposition of flexible springs between the axles and the frame-work of the machine or carriage, to leave the jar entirely confined to the wheels. This is important, insomuch that it prevents the loosening of the bolts and framing.

Those who have remarked the loose disjointed rickety mass which an old hackney coach, destitute of such springs, presents, will understand the matter. Mechanism is out of the question with the director: there is a certain structure of machine which all his men are drilled to, and his business is to be a man of taste, a sort of furnisher or upholsterer; and if he understand human nature, and can unite the powers of the sycophant to his taste, he will probably succeed with the ignorant remarkably well. There is one advantage in carriages. The necessary form they have taken, not by design, but owing to their mechanical construction, is that of lines formed out of the elipse. This of course must add to their beauty. The carriage builder is, in short, a manufacturing artist,—a trade which is well adapted for getting money; and there is never a want of wealthy customers, not over-wise or remarkably skilled in physical science. The reviewer says, "Let us adopt the best London-made carriage, with all its improvements, and if we can succeed in any thing it will be in propelling such a vehicle!" He speaks from the depths of ignorance, in which some sly carriage builder, fearing for his trade, has obfuscated his natural sagacity. When he succeeds in converting one of these "nearly perfect" vehicles into a steamer, he may hope that the *Foreign Quarterly* will become a text book for the Red Men of the West. For the purposes of steam, carriages must take essentially a new form. As a proof of carriage "perfeotion," look at the fact that they have grown bit by bit, and parts have been retained without any motive, when their utility has long vanished; just as large extinguishers may be seen forming a part of the area rails at the west end of the town, long after the flambeaux for which they were originally contrived have gone out of use by giving place to gas. The carriages of by-gone years were usually covered with black greasy leather on the roof and upper portions of the sides, to keep out the rain. This leather was usually fastened on with brass coffin nails, in the manner of old-fashioned horse-hair seated chairs. Such a rude mode of keeping out the weather has long since given place to better inventions, but the black colour of the upper half still remains, now that paint and varnish are used. The absurdity of this may be understood, by fancying how a house would look with the lower part of the walls blue, or green, or yellow, and the upper part black. Yet from long being accustomed to see carriages so, we do not notice the deformity. In the profusion of finish and ornament we do not notice the inferiority of the mechanism; just as the old ruinous house in the Arab tale assumed a gorgeous appearance when covered with Eastern tapestry by the orders of Il Bondocani.

The objections which the reviewer makes to the steam-carriages at present in use seem to be reasonable enough, but most especially in what relates to their want of efficient springs. The only springs hitherto used have been horizontal, and whoever examines them will readily see that, if they had any play, they would at intervals offer impediments to the motion of the piston, and the true working of the crank which moves the hinder wheels. They are placed in such a situation that they continually vary the distance between the cylinder and the axle, which ought to be in all cases the same to ensure accuracy in the working of the engine. If there be no springs, it is clear that the engine will soon rack itself to pieces with the jarring motion which the road will cause. The springs therefore must be placed not between the carriage and the axles, but between the wheels and the road. I conceive that the principle I proposed for the wheels of steam-boats, might be perfectly applicable to steam-carriages, and thus solve at least one important difficulty which is interposed between them and perfection. The following sketch will serve to explain the plan I contemplate.



1. Is a hoop tire of wrought iron, heated into a cast iron wheel 2 2 2.

2 2 2 A cast iron wheel, prepared with hollows, to admit eight circular springs.

3 3 3 A cast iron wheel, also prepared with hollows, to admit eight circular springs.

4 The end of an axis, on which the cranks are formed.

5 5 5 5 5 5 5 5 Eight circular springs, formed like key rings.

The central wheel, No. 3, we may suppose to be firmly fixed to the axle. The outer wheel is held to it by the eight springs, which press equally on all sides, and are prevented from starting out by the flanges which enclose them, and which on one side should be fixed with bolts, for the purpose of removal in pieces, so that the springs might easily be taken out, if required, to replace them with others. It is obvious that the weight, pressing downwards, would act upon five of the springs at once, so that there would be no unequal pressure. The three upper springs in the mean time would expand and press downwards, keeping the whole in a state of firmness. As the wheel turned round, all the springs would receive the pressure in turn. They should be made of the steel which possesses the greatest portion of elasticity, and accurately tempered. There would be one advantage attendant upon this mode of springing a carriage, from which other modes are precluded. With little trouble, a set of springs might be taken out, and another set introduced, for a heavier or lighter load. A broken spring might be removed in a very short space of time. It may perhaps be objected, that springs in this position would be much exposed to mud and rust. This is the case with all springs, but I should imagine that the evil might be remedied by tinning them. Spring steel spurs are plated, and I see no reason why steel carriage springs should not be tinned. The springs of the carriages, which the reviewer describes as "nearly perfect," are constantly rusty. The reason is, that the inner surfaces of the plates are not in any way preserved from the action of the atmosphere. They are not filed, but are left black from the forge, with uneven surfaces, which do not fairly press one against the other. The outsides only are painted, and, when the water gets between the plates, large flakes of rust are formed. This is the cause of the spring plates breaking. Were they tinned this would not happen.

I remain, Sir, yours, &c.,

JUNIUS REDIVIVUS.

SHALDERS' FOUNTAIN-PUMP.

Sir,—The wisest of men has given on record—"*a false witness shall not be unpunished*," and I beg leave to occupy a short space in your interesting and valuable journal to destroy one of the most unprincipled personal attacks, conveyed in the shape of an inuendo, that has ever appeared in any respectable publication. I allude to an article signed Robert Mallet, 94, Capel-street, Dublin. Oct. 15, 1832.

This person has taken leave to inform you that he was called upon in Dublin by the proprietor of the "patent fountain-pump," "who wished us to buy his patent right for Ireland"—that "they had a narrow escape from what seemed a very ill-looking transaction;" and that they "afterwards found the gentleman had also been in treaty with a worthy Alderman of this city, who had actually bought the supposed patent right."

Now, it is one thing to ride a tilt out of a desire to appear in print, and quite another to exemplify the experience and ability of a talented correspondent; while, under any circumstances, designedly to publish what is maliciously and wholly untrue, is inexcusable. And you and your numerous readers will be able to judge from the following brief statement of facts, whether this Robert Mallet does not show malice unprovoked, and exemplify a want of principle, in publishing an untrue statement.

About April, 1830, I directed my patent agents, Messrs. Newton and Berry, to lodge for me a caveat for a patent for the kingdom of Ireland, for certain improvements in hydraulics, continuing the caveat as might be necessary until the patent should be completed; and shortly after I supplied to my friend, E. J. Shirley, Esq., M. P. for the county of Monaghan, several patent fountain-pumps. These were used in some works on the estates of that gentleman so much to his satisfaction, that at his instance I arranged for future supplies to be given by Mr. Alexander Shekelton, a respectable iron-founder at Dundalk, who has made successful progress under the invention.

In 1831 I was favoured with several

letters from E. J. Shirley, Esq. and Mr. Shekelton, urging the diffusion of the valuable invention throughout Ireland, where in the mines, for agricultural drainage, and in assisting the rising manufactories of the country, it would prove so beneficial; and Mr. Robert Wyon, of No. 18, Lower Ormond Quay, Dublin, was obligingly noticed to me by those gentlemen as willing to undertake an agency, with a view to making known the invention in Ireland. I accordingly invited Mr. Wyon over to London, and confided to his care working-models and patent fountain-pumps, as per invoice under date Oct. 7, 1831, amount £243 2*s.* 6*d.* Mr. Wyon having duly received what was committed to his care, punctually attended to the displaying of the same, and interchanged in very frequent correspondence with Mr. Edward Manton of my establishment.

But finding that the spread of the invention did not seem to wear any decided character, and having personal acquaintances in Dublin, I revisited that city in July last, with a view to realise the co-operation of some respectable house or party. Amongst others whom I called upon was this Robert Mallet and his father, being told the latter was a plumber of some years' standing, No. 8, Ryder's-row, Dublin. The result of two interviews led me to infer, that although Mr. Robert Mallet and his father were quite agreeable that I should transfer into their hands my property then lying in Dublin, invoice amount £243 2*s.* 6*d.*, yet he seemed at the same time to possess a better relish for what we in England distinguish as palaver and botheration, than to be careful to prosecute business with mind and industry.

I happily passed him aside, and availed myself of the introduction of a wellknwn individual in Dublin in a call on Mr. Alderman Hodges in Sackville-street. And here a contrast, as light opposed to darkness, was manifest. The worthy Alderman informed me had seen my patent in operation at Liverpool, at Messrs. E. D. Maddock and Co., my respectable correspondents, to whom I had granted a patent-right for that port; also he had seen what was in operation at Mr. Shekelton's works at Dundalk; and being well satisfied with the great intrinsic merits of the invention, would willingly pass on with me to Lower Ormond Quay to inspect the machinery and models, which I then informed him were held by Mr. Wyon for my account. Having called on Mr. Alderman Hodges the following morning, we decided upon our arrangements in the space of a short half hour. I gave orders for the immediate transfer of the property from Lower Ormond Quay to the Alderman's warehouses and works in Sackville-street. And a minute, of which the following is a copy, was subsequently entered on the printed journal of correspondence for the observation of the business-houses in my connexion:—

"This gentleman, in addition to fulfilling the engagements required at his hands when the license for patent-rights for the city, port, and district of Dublin was granted to him, volunteered to pay all the expenses of the patent for the kingdom of Ireland, and to share with Mr. Beare the gain or loss to accrue from the same; being, as the worthy Alderman observed, determined to take up so useful an invention for the benefit of his country, and that the same should be promptly diffused throughout Ireland for the welfare of all true Irishmen."

On my return to London I valued on Mr. Alderman Hodges at seven days' date, in favour of my patent-agents, Messrs. Newton and Berry, amount £150, and my *patent for the kingdom of Ireland* is now held by and in the hands of Mr. Alderman Hodges, 28, Lower Sackville-street, Dublin; the patent has the official great seal of the kingdom appended to it, with the accustomed official signatures of the Earl of Granard, John Cummins, Deputy Clerk Crown and Hanaper; and being enrolled in the office of the Rolls of his Majesty's High Court of Chancery in Ireland, has the official signature of H. Wogan, Deputy Keeper of the Rolls, &c. &c. &c.

Here, then, I conclude my reply to the unprincipled insinuations under the signature of Robert Mallet.

But observations have been also made to the purport that the invention under the patent for England, as taken out by my uncle, Mr. Shalders, is not, in the judgment of this Robert Mallet, either an original or an important invention, and that the patent is not good. I beg leave to state that the patent was most particularly investigated, both in regard to its great usefulness and its perfect inviolability,

previously to my making the purchase of it from my uncle, Mr. Shalders." Also that I have introduced it in the Royal Navy, where in due process of time it will supersede the use of the chain-pumps as well as that of all the usual friction hand-pumps; that I have introduced it in the service of the Honourable East India Company; likewise in the West India and general merchants' service; and already enumerate as my highly respectable houses of correspondence many of the most eminent civil en gineers, iron and brass founders, and machinists of the United Kingdom, to whom I have granted under deed the exercise of the patent-right for their respective districts.

I have, in addition to all this, obtained patents for France, the Netherlands, Russia, Denmark, Prussia, Sweden, and Austria, and secured the co-operation of most respectable agents in each of these countries. It may, perhaps, suffice to mention the name of the illustrious chemist, Berzelius, who has undertaken the agency at Stockholm.

My object in directing the favour of your attention to the list of the patents which I have secured for the different empires and states which I have now so briefly enumerated, is to show by positive evidence the poverty of research which is displayed in the intemperate assertion of Mr. Mallet, which led him to state the principle of the patent fountain-pump is not original, seeing that, in obtaining my patent for the empire of Russia, although assisted by his Excellency Prince Lieven and the Russian Consul-General, a period of one year and seven months was actually consumed, during which a correspondence was entertained from St. Petersburgh with the principal academical institutions and the most learned bodies throughout Europe, it being the governing maxim of Russia to grant a patent only for what shall appear—first, an indisputably original invention; or, secondly, an advancement in the arts which shall be obviously of palpable importance and general utility.

These points being fully established, and a patent for the Russian empire granted, no interference is afterwards allowed in the rights of the same, but all the powers and privileges are secured to the patentee in the fullest manner by the Government.

I have been recommended by my legal advisers to raise an action for the recovery of damages against this Robert Mallet, whose signature bears the address of Capel-street, Dublin; but I incline for the present, to place this reply under his observation, through the medium of your valuable work, which as a journal of established practical science, has for so long a period conveyed to the judgment of its many readers what has frequently been of such high import for the regulation of both mind and conduct.

"Seest thou a man that is wise in his own conceit? There is more hope of a fool than of him."

I am, Sir,

Your faithful servant,

JOHN BEARE,

(Proprietor of the Gravitating Expressing Fountain, commonly called the Patent Fountain-Pump.)

7, Pall Mall East, London,
Nov. 29, 1832.

LETTER FROM MR. SHALDERS TO MR. MALLET.*

Mr. Mallet,—I have no patent for Ireland; the license granted for England is enrolled; and of French books or language I have no knowledge. But a drawing and description of the patent-pump invented by Mr. Benjamin Martin, optician, Fleet-street, London, as given at Court, July 5, 1766, was joyfully pointed out to me by a junto of the Norwich and Norfolk front-rank pump-makers soon after I had specified, pretending it was like my invention; yet I think they never insulted common sense by publishing such an absurdity. For whoever maketh oath that my fountain is like that collapsing, jolting, valueless pump, it will be the easiest thing imaginable to prove to the eyes, ears, and feelings of a jury that he is an ignorant or a worse evidence. The machines differ as widely as possible in each and every part and as a whole. See No. 364, Mech Mag. Make trials extensively as you please, but as you discern no difference between leather and a manufactured leather cone—a garden-roll and a sugar-loaf—a barrow-wheel and a bushel-measure—I fear you

* We deem it proper, for obvious reasons, that Mr. Shalders should be allowed to defend himself in his own way; but we regret that he seems to have yet to learn the value of temperate and discreet language.—Ed. M. M.

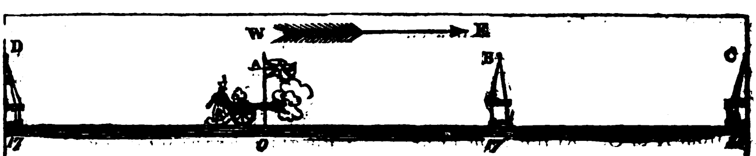
are not the man for accurate hydraulic experiments. An apparatus for raising or conveying water or any other fluid for any purpose, is the title of my patent. Whether named significantly or not, consult Dr. Johnson; and why the expresser acts free as a fish in the sea, see Mech. Mag. vol. viii. p. 439. Judging by the sample, it will be difficult to make you write like a gentleman; but I will if possible make you look like one, by presenting you with a superfine suit of clothes, beaver hat, and Wellington boots, when you can equal my rolling go-fountain with your scraping go-pump within 50 per cent. by actual trial, as proposed in the London *Courier* paper, April 4, 1829. One fountain has raised the water required at Mr. Thornton's, a public brewer at Beccles, to about 30 feet; and has been worked many hours daily for almost six years, and only three or four five-shilling connectors have been worn out; so that in answer to your allusion to the gun—the lock, stock, and barrel may last a century, and only the flint or leather want renewing. You being about making trials upon a large scale is the very thing I want to have done—the most capacious fountain I have yet sold being only a treble motion, No. 3, which delivers 1000 tons per three hours. Thomas Trench Berney, Esq., Morton Hall, directed his engineer how to fix it about a year ago at his Marshes, near Yarmouth, and he called to congratulate me upon its complete success the hour your blustering letter came to hand. Now, as a number 0·3 would deliver about 3000 tons of water in one hour, that is the part of the scale such men as you should work at. You say I lead the public: I say the public drive me; for last week about 50 dozen connectors were cleared off, and 100 dozen more must be prepared as soon as possible. My room is 56 feet by 27, and 22 feet 10 inches from floor to ceiling, where my experimental fountain was at work in 1824, upon which, with cranks, levers, wheels, beams, ropes, tubes, cocks at different heights, belts, and spring steelyards, I could ring 500 changes, and measure POWER and EFFECT to one per cent., AND THAT WAS THE BOOK TO STUDY PROFOUNDLY THE ART OF RAISING WATER. And I do consider, by and according to (what you do not understand) the laws of motion, that until the lighter weight raise up the heavier when going through the same space—a pendulum let fall from the horizontal line vibrates to a higher level—action be exceeded by re-action—and the effect produced be greater than the power expended,—that the expressing-fountain will not be surpassed.

Yours truly,

W. SHALDERS.

Norwich.

EFFECT OF THE EARTH'S ROTATION ON PROJECTILES.



Sir,—The following paragraph, which first appeared in the *Lincoln Mercury*, seemed so extraordinary to some person, that it was transferred to the columns of the London *Morning Herald* of the 12th instant, under the title of—

"PUZZLER EXTRAORDINARY. — It is said that the earth revolves on its centre in 24 hours; its speed, therefore, at the surface is about 1,042 miles an hour, or 17 miles a minute—then why will not a bullet fly double the space when shot west, that it will when shot east? Suppose the speed of the bullet to be about the speed of the earth—during the minute the bullet is flying 17 miles to the east, the place of firing is, by the motion of the earth, 17 miles to the east; so the end of the range of the bullet will be at the place of firing; and during the minute a bullet is flying 17 miles in a direction west, the earth passes over 17 miles easterly; thus the distance from the place of firing to the end of the bullet's westerly range (17 miles) is 34 miles. Now, it is known that, whether a bullet

be shot east or west, it always falls an equal distance from the place of firing."

Now, Sir, I should think it *very* extraordinary indeed, if any person acquainted with the first principles of the laws of motion was for a moment *puzzled* to explain the seeming difficulty into which the writer has fallen. As the problem is, however, a somewhat curious one, perhaps the following elucidation may be considered worthy of a corner in your Magazine.

For the sake of simplicity, we will assume the velocities exactly as stated by the writer, without any regard to their correctness, as that will in no way influence the general question.

For the better understanding of the argument, it will be necessary for the reader to transport himself from the earth's surface, and to suppose himself at a distance, looking at the earth exactly as he does at the accompanying diagram, which is intended to represent a small portion of the earth's circumference. We will suppose an artilleryman stationed at A, with a cannon whose range is 17 miles in a minute. Now it will be essentially necessary to understand, that the earth is moving from West (W) to East (E) with a velocity at its surface of 17 miles per minute, and also that this motion is communicated to every body on its surface. It follows, therefore, that the cannon ball, previous to, and at the moment of firing the gun, is moving from west to east with this velocity; the discharge of the piece, however, gives it *another velocity* equal, and in addition to that previously communicated by the earth. The ball consequently travels through space with a velocity of 34 miles per minute; and at the expiration of the minute, the ball will have passed from A to C. At the time of firing, however, the gun and the obelisk C were moving 17 miles per minute; in this time, therefore, the gun will have travelled from A to B—and the obelisk from B to C, when the ball will strike it with a percussive force equal to the difference of their respective velocities;—that is, with a force due to the velocity of 17 miles per minute—the difference between 34 and 17. At this time the gun and the ball will be 17 miles asunder.

But we will suppose the gun turned round and fired at the mark D, in a direction opposite to that in which the earth is moving. We must here again remember that the cannon and ball are continually moving in the direction W E, with the velocity before stated, of 17 miles per minute. When the gun is fired, the powder gives the ball an impetus in the direction A D, sufficient to generate a velocity of 17 miles per minute. But two forces that are equal, and acting in opposite directions, destroy each other; and in this case the motion given by the earth, and that given by the powder, being equal, and acting in opposite directions, motion is destroyed and the ball stands still at A. But the obelisk D, moving with the velocity before stated, will pass from D to A (17 miles) in the minute, and strike the balls with the percussive force due to that velocity. The cannon will have passed from A to B in the same time, and at the end of the experiment the gun and ball will again be exactly 17 miles asunder; although in this case the ball was fired in the direction opposite to that in which the earth was moving, forming the reverse of the first experiment.

From the foregoing it will be seen that not only the distance, but also the percussive force, is in each case precisely the same; because it matters not whether the ball strike the object, or the object the ball, so long as the velocities are the same.

The atmospheric resistance has not been taken into consideration, because it is in every case the same, and therefore in no way alters the position that is established.

With different velocities, the distances, &c. will differ, but the general principles will still hold good, and the result will be that perfect uniformity which has constituted in the mind of some person the PUZZLER EXTRAORDINARY.

I am, Sir, yours respectfully,

W. BADDELEY.

STEAM TRAVELLING ON COMMON ROADS.

Sir,—Pray allow me to say a word or two to Mr. Vere, who, by your last number, appears to have taken the few remarks I made in answer to his attack on me in very ill part. I am sorry he has done so, and, since he feels so much hurt at being called "another guess-sort of man" from his compatriot "Animo," I beg to soothe his feelings by assuring him that, if he pleases, he may take all

the observations I made on that gentleman to himself. If I did not put the saddle on the right *horse* at first, Mr. V. is fully welcome to it, now he has complained of the injustice done him.

Mr. Vere is mistaken if he supposes I am a thick-and-thin admirer of any particular steam-carriage whatsoever. The note on which he commented said nothing of the vast superiority of Mr. Gurney's boiler over Mr. Hancock's, or any one else's; and for that reason, among others, it was, that Mr. Vere's upholding, under cover of a reply *to that note*, the merits of Hancock's boiler against all comers, but especially Gurney, seemed to evince such a wonderfully "tender care" of Mr. H.'s reputation. It would have been something more to the purpose, if, instead of giving "a scientific sifting" of the construction of Mr. H.'s boiler (which was not at all in question), Mr. Vere had brought forward some facts tending to show that steam locomotion had *not* made the "tardy progress" attributed to it,—that it was getting on as fast as was expected; and he would have done better, the second time, if, instead of offering "satisfaction," in a style redolent of Chalk-farm, and giving his *card* with such an air, he had taken upon himself to deny my assertion, in the reply he complains of, that one of the chief reasons why the steam-carriage projectors (his friend Mr. Hancock, of course, among the number,) do not find the public such staunch supporters as they wish, is the overpowering odour of *puffery* about most of them. Messrs. Ogle and Summers certainly bear off the bell in this particular, but Mr. Hancock is not himself quite free from the taint,—at least such has been my impression, since seeing, among other indications, a staring engraving of his carriage as a frontispiece to Sir Richard Phillips's "Million of Facts," with some such modest inscription as (I quote from memory) "The Triumph of Science in 1832!"

The facts the public want are such as J. H. B. of Birmingham (page 122) enquires for,—the very facts which seem to be the hardest to come at. As you observe, Mr. Editor, "the great defect of all the statements hitherto sent forth to the world, on the subject of steam-travelling on common roads, has been, that they never contain *the whole truth*:" and, until the whole truth is made known, it will be always suspected that "there is something rotten in the state of Denmark," and a corresponding backwardness to afford pecuniary support will be shown.

I must decline Mr. Vere's invitation to give my name and address, for two reasons:—1st. Because I cannot conceive, why, on a matter of such publicity as the present, anonymous discussion may not be quite as "pleasant," and as valuable as any other:—And, 2d, Because I have no ambition to engage in an "affair of honour," and I am afraid Mr. V.'s hint about "satisfaction," can allude to nothing else! I will, however, so far satisfy that gentleman's curiosity about my "occupations" as to tell him what they are *not*: I am not, then, the bellows-blower to any engineer whatever—it is not *my* business to keep up a perpetual *puff* towards any steam-carriage in this world.

But I have the honour to be,

Sir, yours, truly,

F. H.

Dec. 4, 1832.

DECIMAL DIVISION OF THE COIN.

Sir,—I beg to enclose a plan for the adoption of a decimal coin in this country, for insertion in your valuable Magazine. I believe most men of science regret that something of the kind has not been ere now introduced into this country.

I am, Sir, your obedient servant,

JOHN JACKSON.

Coburg-road, Kent-road, Oct. 25, 1832.

Plan for the Introduction of a Decimal Division of the Coin of Great Britain.

1st—Of the division of the pound sterling.

The sovereign, or pound sterling, should retain its present value, be the integer and equal in value to 1,000 pieces of a new copper coin, as hereafter mentioned.

2d—Of the division, &c. of our silver coin.

The silver coin to retain its relative value to the pound sterling, remain in circulation, and retain its present name, if thought necessary.

It might be advisable, on the issue of a new silver coin, to have them denominated according to the number of copper coin each contains, which will be found by the following table.

3d—Of the proposed new copper coin.

The new copper coin should be made of the value of $\frac{24}{25}$ of a farthing, viz. 25 of them equal to sixpence, 50 to one shilling, 100 equal to two shillings, and consequently 1,000 equal to the pound sterling, as above-mentioned.

It would be desirable that a new coinage on this scale should be issued as soon as convenient, leaving the old coin in circulation for four or five years, and thus giving the mind time to become gradually acquainted with its relative value.

TABLE shewing the Numbers of the proposed Copper Coin that are equal in Value to our present Silver Coin.

New Copper Coin.	Shillings.	
1000	20	0
975	19	6
950	19	0
925	18	6
900	18	0
875	17	6
850	17	0
825	16	6
800	16	0
775	15	6
750	15	0
725	14	6
700	14	0
675	13	6
650	13	0
625	12	6
600	12	0
575	11	6
550	11	0
525	10	6
500	10	0
475	9	6
450	9	0
425	8	6
400	8	0
375	7	6
350	7	0
325	6	6
300	6	0
275	5	6
250	5	0
225	4	6
200	4	0
175	3	6
150	3	0
125	2	6
100	2	0
75	1	6
50	1	0
25	0	6

It will be seen, by the above Table, that our present silver coin is susceptible of the proposed alteration, each containing a certain number of the proposed coin; and that the numbers representing the copper coin are the common decimals of a pound sterling.

Observations.

To prevent inconvenience and confusion, it would be necessary that the introduction should be slow and progressive, for which purpose it would be advisable,

1st. That a new copper coin should be issued as soon as convenient after the adoption of the above plan.

2d. That the present gold, silver, and copper coin should remain in circulation for a convenient space of time.

3d. That all accounts at public offices and places under Government should be kept according to the proposed alteration.

4th. That all payments made by Government should be made according to the new coin.

5th. That all taxes should be collected in the same manner.

6th. That all duties, customs, &c., be regulated and payments made in the new coin; in short, that Government, by adopting this method, gradually prepare the mind and pave the way for its general introduction.

It will be found that few countries which have adopted the decimal division of their coins possessed the facilities for a change that we do. Our silver coin requires no alteration, and may still retain its old value. It is, properly speaking, only in the copper coin that a change would take place; and though with respect to that we are unable to obtain a nearer approximation of whole numbers than 25 to 24, yet the difference is so slight, that the popular mind would easily become habituated to it. The man of business will suffer but little inconvenience, the accountant and arithmetician none.

REMARKS ON MR. HALL'S STEAM-ENGINE IMPROVEMENTS.

Sir,—In these days of quackery, extraordinary announcements are most certain to create suspicion; and whatever may be the real value of Mr. Hall's five improvements on the steam-engine, his statement of their having effected a saving equivalent to two-thirds of the fuel appeared so incredible to me, that I read the article again and again without being able to discover by what means such an immense saving could be effected in an engine doing a fair quantum of work. I deem it, therefore, a duty incumbent on me, as one of the profession, to make a few remarks, hoping the patentee will give me credit when I say they are made with a view of obviating the necessity of taking a journey of 120 or 130 miles to see the whole (as Mr. H. says) in successful operation.

The 1st improvement on Mr. H.'s list is, without doubt, complicated beyond all precedent, as may be seen by inspecting the sections A and B, each showing but one-sixth of the work in every individual piston; and all to save packing it perhaps once or twice a year, (no, I forget, that belongs to the lubrication,) to save friction, and prevent the steam from

passing it, (I beg pardon, this is also to be effected by the lubrication,) but if the parts of the piston work to the extent provided for in its manufacture (although not enumerated among its advantages by Mr. H.), the surface against which the packing rubs is thereby lengthened six inches for every revolution made by the fly-wheel.

2d. The slide is truly a counterpart of the piston, complication being again the order of the day, and apparently without any corresponding advantage; for however difficult it may be to make slide-valves of the common construction sufficiently accurate and steam-tight, still it is no more than is commonly done by the regular manufacturers of steam-engines. Mr. H. says they are warped and rendered uneven by the application of heat; but as it appears by the sections, &c., that the adjustment of the metallic bars, packings, and steel fan-plates is dependent on certain screws, which it is impossible to get at during the working of the engine, and that there must also be great difficulty in accurately jointing the said steel fan-plates, so as to make them steam-tight, I am utterly incapable of discovering any superiority which it may possess.

3d. As the improved method of lubrication cannot be adopted without the improvement in condensation, I think it is hardly entitled to be classed as a separate invention. But is Mr H. quite sure that oil would not become stiff by the repeated action of heat, and thereby be rendered unfit to be returned by a pump?

4th. The improved method of condensation consists in avoiding the injection-water, and is effected by a particular mode of using metallic surfaces, the peculiarity of which (all other attempts having proved abortive) lies in causing the steam to pass through the apparatus in its condensed state. What can Mr. H. mean? Does he not know what condensed steam is, that he talks of passing steam in that state through his improved condensing-apparatus, by way of keeping it in contact with the metallic surfaces, nearly 1800 times longer than if it were to pervade them in its uncondensed state? We will now look to the illustrative plate. O is the condenser. What is a condenser? a vessel in which condensation is effected, no matter how. L is a longitudinal, and M a transverse section of a system of metallic surfaces, which Mr. H. calls a refrigerator in the form of pipes; but as, from his particular mode of keeping them full of water instead of steam, they can form no part of a condensing-apparatus, it is impossible to discover what earthly use they can be of, unless he may have found that a reduction in the temperature of the water of condensation is essential to a saving of fuel.

Not being able to find any description of his improved method of feeding boilers, I must conclude without touching on his 5th invention,

And remain, Sir, yours, &c.

T. V. Robson.

November 26, 1832.

NEW MATHEMATICAL QUESTIONS.

Question 1 by Iver Maciver.

Incribe the greatest cone in a given spheroid.

2. By a Cambridge Student.

AB and AC, being two straight lines given in position, find the locus of a point D, so that if straight lines DE,DF be drawn perpendicular to AB, AC, the sum of the perpendiculars may be equal to a given straight line.

3. By a Woolwich Cadet.

A 13-inch mortar, with a charge of $7\frac{1}{4}$lbs. powder, is found to throw a shell of 196lbs. 4000 feet on an ascending plane; the elevation of the mortar being 36° 32′. Required the elevation of the plane?

4. By Kinclaven.

In how many throws with three dice may a person undertake, for an even wager, to throw all the triplets in a given specified order?

5. By a Westminster Scholar.

To find a point in the base of a given scalene triangle, so that the sum of the two perpendiculars drawn from it to the two sides, may be equal to a given straight line.

6. By Cargil.

A. bets B. 4 to 3 that he (A.) in tossing 5 halfpence will have either 3 heads or 3 tails. Required the precise odds.

7. By N. Logan.

Demonstrate from G.S.'s figure (No.

415) that cos. $(A+B)$ Sin $B+$cos. $(A+B)$ cos. $B=$cos. A.

8. *By Dundee.*

Demonstrate the truth of the binomial theorem when the exponent is negative and fractional.

9. *By Zeno.*

Given the perimter and the difference between the perpendicular and base of a right-angled triangle, how to construct it?

10. *By L. S.*

Demonstrate the 22d and 23d propositions of the 5th book of Euclid, without the assistance of the 20th and 21st propositions.

11. *By E. J. Erichson, Pupil, Mansion House, Hammersmith.*

Three poles, A, B, and C, are perpendicular to the horizon; their heights are 50, 35, and 44 feet respectively, and the horizontal distances between them are $AB=100$, $AC=80$, and $BC=70$ feet. Required to find a point in the horizontal plane B, equidistant from the tops of the three poles, and calculate what the length of that line will be.

12. *By R. W.*

Given the positions of the centre of gravity, of the centres of the circumscribed and of the inscribed circles about and in a triangle; to determine the triangle by a general solution.

[We have received an "Important Problem in Geometry," which the author challenges "any other geometrician in Europe" to solve. We think he labours under a great mistake, and wish him to reconsider the subject. He evidently fancies that he has hit on a method of finding the precise quadrature of the circle, because he has discovered that the cosines of two arcs (E, J′ and J, E′) are in a ratio of equality; but if he will investigate the matter a little farther, he will find that it by no means follows that the ratio *of the arcs themselves* can be exactly determined.—Ed.]

MR. DOWNING.

The *Examiner* of Sunday last contains a letter from "Junius Redivivus," under the head of "Superior Endowments in Labouring Life," in which he thus speaks of the letter which lately appeared in this journal from the pen of Mr. Samuel Downing:—

"There is another 'sign of the times' abroad. A hard-handed mechanic, 'a man of occupation,' one of those whom the 'Society for the Diffusion of Useful Knowledge' fondly believe to be their inferiors in intellect, and therefore use towards them a patronising tone—a hard-handed mechanic has come forth to triumph in the mighty power of mind over the purposeless verbiage put forth by Henry Lord Brougham and Vaux, High Chancellor of England, for the furtherance of what he is pleased to call the "Education of the People." In the Mechanics' Magazine, of November 17th, there is a letter from Samuel Downing, cabinet-maker, on the subject of the Education of the Working Classes, which, for sound reasoning, moral knowledge, power and understanding of language, deep sympathy with abused and insulted humanity, persuasive eloquence, intense and refined feelings of beauty, and pure love of glorious and intellectual freedom, any man, however high his station or his acquirements, might be proud to have written. The 'Society'—I speak not of them individually, but after the works they have put forth—may with great advantage put themselves to school to one of the body they have pretended to teach. If they be sincere in their desire to instruct, if they really wish to do good, and if, upon examination, Samuel Downing prove to be all that his letter gives indication of, they can do nothing so effectual towards regaining the lost confidence of the people, as by taking Samuel Downing from the manual labour in which his talents are to a great extent wasted, and appointing him their Minister of Public Instruction. They themselves have given evidence that they are unfitted for the task. Let them resign it to one of the many who have passed through the ordeal by which fitness is conferred."

After quoting some passages of Mr. Downing's letter by way of specimen, the *Examiner's* spirited and benevolent correspondent thus concludes:—

"Will Henry Brougham place Samuel Downing in a situation where his utility may meet full scope; or will he wait till the public suffrage has aided his judgment, as it did in the case of Miss Martineau?* The Chancellor is in a *premunire.* Real talent cannot be kept in the shade by *charlatanerie,* and a man who can write the language of truth in the forcible style which has been quoted, is likely to be too 'stiff-backed' to make a supple tool. Power reigns in opinion. Eloquence and truth united are greater swayers of opinion than either wealth, wigs, or woolsacks. Samuel Downing, Cabinet-maker! They are words of ominous sound. Let Henry Brougham give him the means of teaching, by setting him to write books of instruction, for which he seems well fitted, and the people will know how to be grateful.

It would, indeed, be doing a very noble thing were the Lord Chancellor to extend a helping hand to our poor but learned Cabinet-maker; nor can we permit ourselves to suppose that such claims as his will suffer with a person of his Lordship's high-mindedness and liberality, from the want of courteousness observa-

* The author of the admirable "Illustrations of Political Economy," which were offered to the Useful Knowledge Society, of which Lord Brougham is Chairman, but declined; though better worth publishing, and better calculated to benefit the people, than all the works which this Society has yet produced.—Ed. M. M.

ble in Redivivus's generous and well-meant endeavour to press them on his Lordship's notice. We have no knowledge of Mr. Downing beyond what has been derived from an occasional correspondence with him; but we see enough in his letters, published and unpublished, to induce us to believe that he lacks but the accidental gifts of fortune, to enable him to take a foremost station among the scholars and philosophers of his time. In one of the latest of his unpublished letters Mr. Downing made us acquainted with a scheme which he formed some "two or three years ago" for "bringing himself into notice," which displays so firm a consciousness of his own strength, so earnest a thirsting after distinction, and so praiseworthy a readiness to task himself to the utmost in order to achieve for himself a name in the world, that we cannot refrain—though at the risk of doing some violence to that modesty which caused the scheme to be abandoned almost as soon as conceived—from laying some particulars of it before our readers. Mr. D.'s plan was to insert an advertisement in the papers, conceived in the following terms:—

"A poor and scantily-educated lover of knowledge proposes to the rich and learned an opportunity of displaying their disinterestedness in the following manner:—He engages to do within twelve months any one of these three things—1st. To acquire, so as to translate passably, the knowledge of twelve languages, by means of books alone. Or, 2d. To produce models of twelve original pieces of mechanism, of his own invention and workmanship. Or, 3d. To make himself acquainted with twelve departments of mathematical and natural philosophy and literature, producing at the end of the stipulated term a digest of such discoveries as he shall have made in the course of his studies. Give him twenty-four months instead of twelve, and he will engage to complete the whole of the above tasks. His only conditions are, that the expense of books and materials shall be defrayed by the party he may engage with, and that a suitable maintenance shall be furnished him during the period of twelve or twenty-four months, as the case may be."

We think it a pity this advertisement was not published; for though it would probably have been noticed with derision by the multitude, there might have been some one among "the rich and learned," sufficiently aware of the difficulties to which poor scholars are commonly exposed, and of the strange courses on which they are sometimes driven, to have furnished the patronage that was solicited; and thus the "two or three years" which Mr. D. has lost might have been saved. The human mind seems destined to experience, in its struggles for developement, the same sort of straits which the poet has finely imagined to attend the soul on its departure from the body—

"In that dread moment, how the frantic soul
Raves round the walls of her clay tenement,
Runs to each avenue, and shrieks for help."
BLAIR.

We infer, from the character of Mr. Downing's proposed challenge, that he is yet a person of not many years; we trust, at all events, that the patronage of which he is in want, will reach him ere it can be said of him, in the language of another bard—

"it came at last
As sunbeams on the blasted blossoms
Fall."

MR. BABBAGE AND THE INTERESTS OF SCIENCE.

Political matters do not, generally speaking, come within the province of this journal, but when the interests of science happen to be mixed up with them, why should we be silent? We look for a great deal of good to science, as well as to every other important interest of the country, from the return to Parliament of a gentleman of Mr. Babbage's eminence in the scientific world, tried independence of spirit, and very searching and business-like habits; and, therefore, we take the liberty to say to every elector of Finsbury who is a reader of this journal, and a friend to the objects which it has specially in view—*Go and vote for Mr. Babbage.* If you are an inventor, whom the iniquitous and oppressive tax on patents shuts out from the field of fair competition, and are desirous of seeing that tax removed—*Go and vote for Mr. Babbage.* If you are a manufacturer, harassed and obstructed in your operations by fiscal regulations, and would see industry as free as the air you breathe—*Go and vote for Mr. Babbage.* If you are a mechanic, depending for your daily bread on a constant and steady demand for the products of your skill, and are as alive as you ought to be to the influence of free trade on your fortunes—*Go and vote for Mr. Babbage.* If, in fine, you are a lover of science for its own sake alone, and would desire to see science honoured in those who most adorn it—Meet us to-day on Islington Green, and *vote for Mr. Babbage.*

LONDON MECHANICS' INSTITUTION.

The December Quarterly General Meeting of this Institution was held on Wednesday evening last, Mr. Vice-President Hemmings in the Chair. The receipts during the past year have deen £1,656 *6s. 7d.*; the expenditure, £1,641 *18s. 4d.* In last quarter's expenditure, is included £150 paid to account of the debt of the Institution, which is now reduced to £3,062.

The average number of Members during the year has been 1062; the present number is 1068.

ANSWERS TO INQUIRIES.

MR. HANCOCK'S BRIGHTON TRIP.—Sir,—I beg in answer to J. H. B., page 122, to state that the performances of the "Infant," on its late trip to Brighton, were as follows:—On the first day it accomplished 38 miles, being at work from about six in the morning till dusk. On the second, it completed the remaining 15½ miles of the distance to Brighton, and returned to the place whence it started —in all 31 miles. On the third it did 16 miles more, and was then in so damaged a state that it had to be put up at a miller's to be repaired, leaving at that time 22 miles of the entire up and down journey unperformed. Various reasons were given for the carriage working so indifferently; but without going into the validity of these reasons, I may say generally, that this experimental trip did nothing towards removing the doubts which exist as to the practicability of applying steam to *quick* travelling on common roads, and was altogether much less successful than many other trials that have been made with steam-carriages.—I am, Sir, your obedient servant,—AN EYE WITNESS.

COLOURS OF RIVERS.—The differences which a "Pedestrian" has observed in the colours of different streams may be owing to a variety of causes. The "yellowish brown" appearance is most commonly caused by the drainings of peat bogs; the "greenish tint," by an intermixture of decayed vegetable matter or ferruginous depositions. The bluest rivers are always the purest; for when this colour predominates, it is an indication that they flow either from a rocky source, or are chiefly fed by mountain snows.

VELOCITY OF SOUND THROUGH WATER.—D. R. will find an account of some interesting experiments on this subject made on the Lake of Geneva, in the *Annales de Chimie* for 1829. The velocity of sound is above four times greater through water than air.

TAWNY PORT.—D. D. has been rightly informed. Tawniness is by no means an infallible criterion of age. The deepest coloured port may be made tawny (as it no doubt often is) by filtering it through charcoal.

MR. HYDE'S "CASE IN PLANE TRIGONOMETRY." —Mech. Mag., May 5, 1832. We differ from Z. X. of Malmesbury, with respect to the sufficiency of Mr. Erichson's solution (4th Aug.) of Mr. Hyde's problem; and as Mr. H. has not himself found fault with it, we may reasonably presume that he also is satisfied with it. Z. X. says, "As you have received solutions of the case from three other Correspondents, it would be gratifying to have these solutions published, as it would doubtless throw some light on the subject; but if none of them is agreeable to Mr. Hyde's conditions, I pledge myself to furnish one without further delay." We have to inform him that *none* of them is *more* agreeable to the conditions of the problem than Mr. Erichson's, and we, therefore, invite him to redeem his pledge.

PARKER'S GOLDEN METAL, though sometimes called *Mosaic Gold*, is a different composition. It consists of copper and zinc in (we believe) nearly equal proportions. Its superiority, as compared with brass, consists less in its superior polish than in its not requiring any gilding or lacquering to bring up the colour.

MISCELLANEOUS.

Restoration of St. David's Cathedral.—The west front wall, 70 feet high and 10 feet thick, had for half a century overhung its base, till at length it projected 4½ feet beyond the perpendicular. The Saxon arches on each side the centre aisle, all the way to the choir, leaned against this wall, so much so that, had it fallen, the whole of the church, as far as the choir, must have fallen with it. Mr. Nash being employed, in 1786, to renovate the cathedral, first constructed a timber buttress on a temporary foundation, and supported the whole of the Saxon arches; he then took down the wall from top to bottom, prepared a new foundation, and rebuilt the wall upright, encased the temporary buttress with stone, and substituted stone arches for the wooden buttress; during which operation not the slightest accident happened; and though this work has been done 45 years, not the slightest settlement has taken place, and it is a perfect work to this day.

Statue of George III.—During the past summer a colossal equestrian statue of George III., by Westmacott. has been erected on the highest point of Snow-hill. The figure terminates the avenue at a distance of about three miles and a half from Windsor Castle, and, of course, forms a prominent object at every step of the way. It is raised upon a mass of stones, intended to represent a rock. The total elevation of the statue and its pedestal is more than fifty feet. The statue itself is twenty-six feet in height. The consequence is, however, of the gradual approach to it through a vista of very lofty trees; and the large forms of the trees immediately surrounding it, greatly diminish the effect of its gigantic proportions. Till the spectator approaches within a hundred yards he does not feel that the figures are of colossal dimensions; and yet we were told by a person who saw the statue before it was placed on its pedestal, that he could not span the fore finger. — *Penny Magazine*. Mr. Chantry foretold from the first that such would be the effect. When examined on the subject before the House of Commons, 30th March, 1831, he observed, "I always considered that a very unfavourable situation for any statue; and in my opinion the statue intended for it will look little, although it measures about 24 (26) feet.

The Chiragon, or Guide for the Hand.—Mr. William Stidolph, a schoolmaster at Blackheath, has invented an apparatus, to which the name of Chiragon is given; by the assistance of which, a person who has become blind after having learned the art of writing, may continue its practice without the risk of confounding words or lines together. It consists of a frame, with a raised margin, upon which margin is placed a narrow piece of wood, having a groove to receive a corresponding key that is attached to a collar or bracelet for the wrist. In the sides of the frame series of notches are cut, into which the grooved piece of wood is placed successively, so as to form the regular intervals between the lines, whilst the hand is permitted by the collar to pass freely from left to right, but is confined to certain limits in its action up and down, or in the direction of the length of the paper used. The writing is effected with Mordan's patent pencils; and we have proved the efficiency of the invention, by writing a letter with its guidance while our eyes were bandaged so as to exclude the sight of every object.—*Athenæum*.

INTERIM NOTICES.

Communications received from J. S.—Mr. Downing—Mr. Mundy—Lambda—Gulielmus—T. A. P. —Mr. Rutter.

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 488.] SATURDAY, DECEMBER 15, 1832. [Price 3d.

FIRST BRITISH EXPERIMENTS IN STEAM NAVIGATION.

Fig. 1.

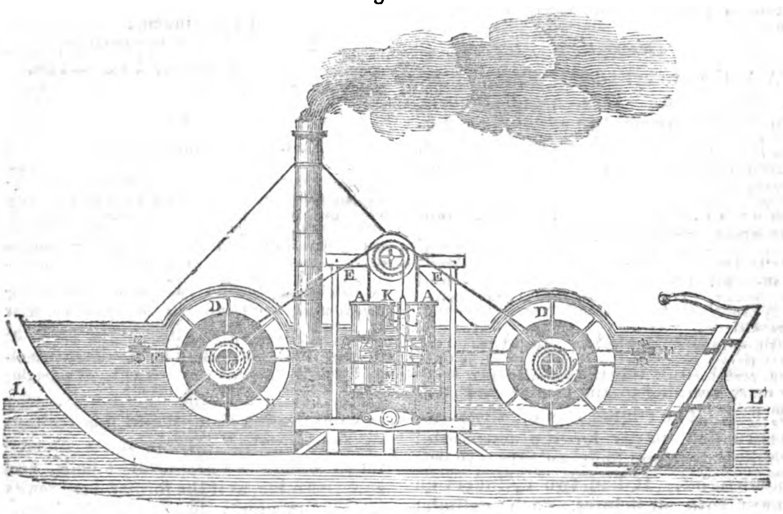
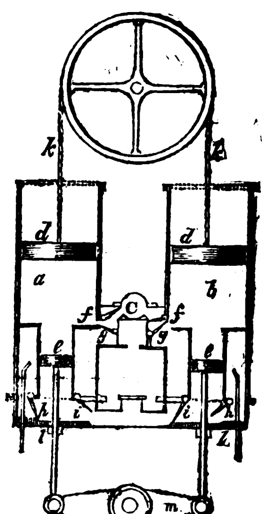


Fig. 2.



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FIRST BRITISH EXPERIMENTS IN STEAM NAVIGATION.

Sir,—The accompanying sketch, fig. 1, represents a lateral section of the original steam boat invented by my father, the late William Symington, and the efficiency of which was twice proved, though on different scales of magnitude, by him, viz. once in 1788, on Dalswinton Lake, Dumfries-shire — and another time, in 1789, on the Forth and Clyde Canal.

Description.

A A, the two cylinders. B, the boiler. C, steam-pipe. D D, paddle-wheels, situated and wrought in a trough extending from the stem to the stern of the boat, which trough allowed free ingress and egress to the water. E E, connecting-chains. FF, direction-pullies. GG, ratchet-wheels, which communicated motion to the paddle wheels. I I, lower piston-rods. H, beam. K, plug-frame and hand-gear. L L, flotation-line. M, water-cistern.

The merit of these exemplifications has been in several publications erroneously awarded to the late Patrick Miller, Esq. The engine was of a peculiar construction, partly for the purpose of avoiding infringement on Mr. Watt's patent-rights. It had two cylinders on atmospheric principles, each cylinder having two pistons, the lower of which acted as an air-pump. The more clearly to illustrate the principles of this part of the machinery, a section of the two cylinders is exhibited in fig. 2. *a* and *b* are the cylinders, *a* being in the act of receiving, and *b* of condensing steam; *c*, the steam-pipe; *dd*, atmospheric pistons, producing, by their alternate action on the ratchet-wheels, rotary motion; *e e*, exhausting-pistons; *ff*, steam-valves; *gg*, exhausting-valves; *hh*, foot-valves; *ii*, discharge-valves; *kk*, connecting-chain; *ll*, injecting-pipes; *m*, beam. From this sketch it must be evident, that while the steam is elevating the atmospheric piston of either cylinder, the lower piston is necessarily depressed, and performs the exhausting stroke of the opposite cylinder, both pistons being connected by means of the beam.

The exemplification of 1789 was propelled by the power of steam at the rate of six miles an hour; thus satisfactorily proving that the performance of the *Charlotte Dundas*, in 1802, as a tug, was not "the first public trial of steam for a useful purpose in navigation," as asserted in a Report of the Forth and Clyde Canal Committee, contained in your Magazine of July 9, 1831.

Sensible of the readiness with which you have inserted my former communications, and perfectly prepared to substantiate every particular which I have advanced,

I remain, Sir,
Your most obedient servant,
WILLIAM SYMINGTON.

Bromley, Nov. 17, 1832.

ART OF BELL-CASTING.

Sir,—On recurring to the paper of V. W. of Clerkenwell, (Mech. Mag., May 19, 1832,) for the purpose of finishing my reply thereto, I plainly perceive somewhat more in the author than a mere captious pragmatic. He would seem disinterested, and yet he cannot forbear showing great displeasure at the publication of my "Introduction to a Treatise on the Proportions of the constituent parts of Bells," &c., and the question is, why this publication should hurt his feelings so exceedingly? He interests himself much to enhance Mr. Drury's bells, and suppress mine, as if the former were really adapted to supply the place of the latter: but the causes assigned in my paper, inserted Sept. 8, 1832, why Mr. D.'s form for bells cannot be adopted on a large scale, may have convinced him of his mistake. I have there shown that the dissimilar forms of the bells fits them for entirely different purposes.

I shall make no question as to the general *good qualities* which V. W. may either lack or possess; but that he is by no means deficient in *assurance*, appears by the following passage:—"I cannot say that I have been able to make out distinctly what the author would be at; except that he wishes the public to subscribe a good round sum to induce him to disclose a something about the proportions of bells, which, his word for it, will be worth all the money."

I certainly have said "a something about the proportions of bells." I have developed not only the principal matters, but every minutia relating to the proportions of their parts, and have defined the respective measures whereby they yield

tones surpassing in melody the generality of bells, and at the same time afford the loudest and most flowing sounds that can be produced by given weights of metal; and in consequence I produce equal peals of bells of much less weight than can possibly be done by the usual methods, and very superior peals of the same weight. In fact, bells or peals of bells, cast with my improvements, have equally deep tones, equally grand sounds, generally sweeter tones, and are heard to a much greater distance, with about three-fourths of the weight of those cast by the common methods; and certainly there could be no impropriety in mentioning what I have effected, albeit it has made this officious gentleman so very sore.

But enough of this. We will now turn to the "eight octaves" he tells us of, and the tables Mr. Drury has calculated thereto.

I presume V. W. will not have the hardihood to tell us that Mr. D. has ever cast two bells eight octaves different in tone? I do not mean to hold a contest respecting the possibility of such an achievment, even on the smallest scale of Mr. D.'s practice: but if I give a display of the matter, it may enlighten V. W. on a point wherein he is evidently in the dark, and at the same time afford amusement to some of your readers.

It is well known that bells which differ in their pitch of tone, must also differ in size, when intended to accompany each other for producing symphony, otherwise the quick vibrations which yield the acute tones must needs overpower and drown the grave tones, which are the effect of slower vibrations, and of course spoil the music. Now, as V. W. makes no parade of Mr. Drury having ever calculated a table of *the sizes which produce equal loudness in bells of different tones*, I cannot but conclude that he is not possessed of such a table, although it undoubtedly would be a very great guide to him in suiting the size of his bells to each other: and the probability is, that neither V. W., nor even Mr. Drury himself, entertains other than vague notions respecting the difference in size of two bells of equal loudness and differing in their tones by eight octaves. They will probably stare when I inform them that the diameter of the grave-toned bell will require to be somewhat more than forty times as great as that of the acute one! Not that there is the least impracticability in making two bells, the diameters of which differ, by this proportion; for allowing the small bell to be two inches in diameter, that of the large one will be only a little more than 80 inches, which is not quite half a foot more than "Great Tom of Lincoln." Of course the diameters are manageable: but what shall we say of the thicknesses? What must be the difference in the proportions of the thicknesses to the diameters of these two bells, to cause a difference of eight octaves in their tones?

Allowing the largest bell to be five inches in thickness (Great Tom is $5\frac{1}{8}$ inches in the thickest part), then the thickness of the smallest bell will be almost eight-tenths of an inch, or not quite one-fourth of an inch less than the radius of the bell! What then must be its vibration? Can it be expected to surpass that of a smith's anvil? But this is not all: this is *the least thickness* the small bell can admit of, the large one being five inches, and would by no means suffice if the ratio of the thicknesses of the two bells was the same in all parts. But, in order to preserve a less thickness in the lower parts (from whence the sound chiefly proceeds), I doubt not but Mr. Drury finds it expedient to increase that of the upper parts in a much greater ratio (perhaps nearly duplicate) in procuring his acuter tones; since, from the shortness of his bells, and their greater thickness, the strength of the connexion of their parts is such as to communicate the aid of the one part to the other the more effectually, and thereby accelerate the vibrations, at the same time that it tends greatly to prevent the different parts from vibrating at different rates. But even this would not suffice to obtain eight octaves: the thickness of the acute bell would be such as to become a complete solid some time before that interval was accomplished, although the thickness were extended outwards (as indeed it ought to be) as well as inwards.

But the impossibility of accomplishing eight octaves, by adding so much thickness to the smallest bell, suggests the necessity of reducing that of the largest. Indeed five inches is certainly an unnecessary thickness for a bell of this size, in which *the vibrating motion tends directly to and from the axis of the bell in the shortest line*,—the form not admitting of

the very great advantage of vibrating in an oblique direction, and thereby obtaining a wider range, in the same proportion as the hypothenuse of a triangle is longer than its shortest side or base. Of course three inches would be more on a par with church bells, as regards *the range* of the vibrations, though certainly not with respect to *their rate;* on the latter of which the pitch of tune entirely depends, while the loudness depends on both, and also on the quantity of surface in contact with the air.

However, we really can afford to reduce a very considerable portion of thickness in the large bell. And although, in diminishing, we are not limited by an impassable boundary as in adding (which cannot increase beyond a solid), yet it does not follow that the reduction can be extended to such a degree as to admit an interval of eight octaves between the two bells. For be it remembered that the ratio of eight octaves is 256 to 1, whence the acute bell must necessarily perform the immense number of 256 vibrations in the same time that the grave bell performs a single vibration; so that the reduction must be carried to a prodigious extreme of thinness to obtain even an insufficient aperture in the small bell: and such enormous extremes in the relative thickness and thinness of the bells must render them so exceedingly disproportionate as to make it doubtful whether either of them would make any noise worthy of being called a musical sound.

That Mr. D. may have calculated his tables to an extent of eight octaves, or even a far greater extent, is possible enough. They are easily extended from the thinness of a brewing copper, on the one hand, to a complete solid on the other. But why extend them so uselessly? V. W. vauntingly mentions their extension to eight octaves by Mr. Drury, as if it were a great achievement! But what else does the utter inutility of such a measure imply than an imperfect knowledge of the subject? There is nothing mysterious in those calculations. I have observed, page 22 of my Introduction, that they depend on very plain, though not altogether simple principles, and that they " are deducible from evident laws, and the innate properties of elastic bodies." As for myself, I calculated such tables so long since as the year 1798; but I was not satisfied with the mere computation of those dimensions that, with perfect execution, will produce the bells in tune, (and from which such small variations as are unavoidable in our means of executing work of this kind seldom cause the tones to deviate more than $\frac{1}{15}$ or $\frac{1}{20}$ of a note, and often much less,) but my tables also include the sizes of the bells producing *equal loudness* in all the different pitches of tune to which they are calculated; and I may add that those tables may be continued to any extent with the greatest facility; the addition of an extra semitone, or any other interval whatsoever, does not require twenty figures in the operation;—the logarithm of the ratio to be added or subtracted (according as the table is to be extended to deeper or sharper tones) need not contain more than six or seven figures, and five figures will suffice in the numeral column.

It was with those particular inquiries that I commenced my researches. To trace out the proportions of the thicknesses of bells to their widths, for producing any required intervals of tune, was the first idea that occurred to me on turning my thoughts to the subject: and this being in some degree involved with the sizes producing equal loudness in bells of different tones, an examination of that followed of course; and as there was nothing either abstruse or difficult to unravel in those investigations, they were speedily effected.

But far otherwise was the investigation of all the parts of the bell. Here, indeed, obscurity and complication appeared blended in perfection. The objects to be attained were a maximum flow of sound with a minimum weight of metal, and such an exact adjustment of all parts of the sounding body as to induce a perfect coincidence throughout, so that the most melodious tone might proceed from it; and to accomplish these in a bell required a complete analysis of its component parts. But to unfold and disentangle the principles from whence the various dimensions are compounded, and thereby render them definable, that the metal might be disposed so as *to produce the utmost sound that a given weight can yield*, and that the parts might be so apportioned as to concur, and *all perfectly harmonise with each other*, was a task of the abstrusest kind: it was indeed a subject altogether involved in mystery.

But what is it that assiduity and per-

severance cannot effect? The most complete success has resulted from my indefatigable application. I chose to make my experiments generally on a full scale; and those were referred to as often as any specious ideas occurred: but perplexed and bewildered by the extreme intricacy of the subject, its manifold considerations, and the darkness in which some of the operating causes were enveloped, my experiments proved that my conceptions were too often erroneous. I soon found that to explore the hidden recesses of such a maze was a work of no ordinary magnitude, and that length of time and great patience were absolutely indispensable to accomplish so arduous a research. Yet I was not discouraged; I had "put my hand to the plough," and was not to be deterred from my pursuits; and at length I completely succeeded in tracing the elements of the constituent parts to their sources, and thence subjected the whole to mathematical calculation, no dimension whatever being left undefined. Neither are my analytical investigations confined to one bell only—they extend to bells of all sizes and tones, so that the measures of every part are rendered equally definite, whether the bells are large or small, or whether their tones are grave or acute.

Thus the completion of the system of the proportions of bells has cost me dear. Nor has it been effected without some egregious blunders; but I have the satisfaction of presuming on its entire accomplishment, seeing that there no longer appears any lack—every dimension and proportion being definitively ascertained for producing the greatest flow of sound joined with the sweetest tone, whatever the size and pitch may be. And it must be acknowledged that the fact of having succeeded in descrying and tracing all the various interwoven foldings, and completely untying such a *Gordian knot*, justifies the ancient adage that "labour overcometh all things."

I am, Sir, yours, respectfully,

JAMES HARRISON.

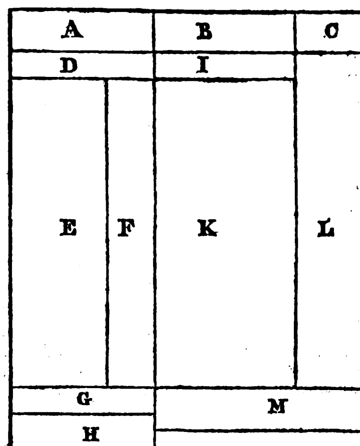
Barton-upon-Humber, Oct. 18, 1832.

[P. S.—In the former part of my reply to V. W., page 374, column 1, line 17 from the bottom, instead of "things" read "thickness;" and at same page and column 2, line 9 from the bottom, instead of "trade" read "tirade."]

MITCHELL'S CLASS-BOARD FOR MARKING THE ATTENDANCE OF CHILDREN AT SCHOOL.

[We extract from the *Sunday School Teachers' Magazine and Journal of Education* for September last, the following description of a class-board for marking the attendance of children at school, which has been invented by our respected correspondent, Mr. E. J. Mitchell, of Bradford, Yorkshire, and has been long in successful use in the Sunday School which has the benefit of his benevolent and useful superintendence. It is a very clever contrivance, and deserving of universal adoption. We have introduced into the description some corrections and emendations with which Mr. M. has kindly favoured us.—ED. M. M.]

The board is made of wood, 7½ inches by 9, and contains a *fixed* slate E, and a *moveable* slate I K L M, and is represented by the following figure. The parts of the board D E G contain *moveable* slides, dovetailed into it, which may be taken out at pleasure. The whole is covered with a slide-top to keep the writing clean and the marks from rubbing out.



A contains printed Hints to Teachers respecting the proper use of the board. B, the months of the year arranged quarterly. C, the number of the class. D, the teacher's name, removeable at pleasure. E, eighteen moveable slides for names of scholars. F is a fixed slate, on which are marked, with slate-pencil, the number of times each child has been absent during

each quarter of the year, and collected from K (the moveable slate) before the marks are washed out. (*See Rewards, below.*) G contains the monitor's name, removed when necessary. H consists of Scripture texts for the encouragement of teachers. I K L M form one slate, divided as above, and made to slide loose into the board. At the end of each quarter the slate is taken out and cleaned; it is then immediately ready for the ensuing quarter. (*See explanation of part F.*) The part I contains 13 squares, in which are registered with slate-pencil the days of the month on which Sunday falls for one quarter. The part K is fluted, and contains squares for marking the children's attendance for one quarter. The part L is used for the visiting-column. (*See explanation below.*) The part M contains 13 double spaces, in which are inserted by the teacher every Sabbath day the actual number of the children who have attended in his class that day. The *upper* space represents the number in the morning, and the *lower* space the number in the afternoon

Advantages of this Class-Board.

1. When names of children are *once* written, they are *never to write again* so long as they continue at school.

2. An increased facility of keeping the children classed according to their attainments in knowledge, as their names and previous attendance are immediately transferable from one class to any other class in the school. (*See Examination, below.*)

3. The board contains no names except children in regular attendance, as in case of death, dismissal, or leaving the school, the slide containing the name of such scholar is withdrawn, and a blank slide put in its place, to be filled up.

4. An easy and simple method of noting how often every child has been absent during the year. (*See Rewards, below.*)

Examination of Classes.

That the above system may be worked well, it is of importance to have one person as examiner in every school, whose duty it is,

1. To keep a private account in a small book of the number of children only, in each class in the school—keeping one page for every class.

2. To examine all new scholars and class them.

3. To withdraw the names of those who have left school, and fill up their places either with new scholars or by a transfer from the lower classes, making at the same time the necessary remarks in his own private book (*see No.* 1.), and in the general registry, of such alteration or dismissal from school.

In fine, to equalise the classes, and preserve a due balance of talent in each class; and though this may appear difficult, it will not upon trial be found so, as an average of half an hour every Sunday is quite sufficient for this purpose. By a reference to his private book, the examiner can always tell which class in the school can admit a fresh scholar, without the trouble of asking the teachers; but no alteration should be made in any class without the teacher's recommendation or approval.

Visiting Absent Scholars.

Where it is practicable, absent scholars are always best visited by their respective teachers; but as from various circumstances this cannot be done, the following plan has been attended with success, and has been provided for in the board by the visiting-column "L."

1. Divide the town or neighbourhood into districts.

2. Name these districts after the letters A B C D E, &c.

3. When a child is received into school, enter first his register number; secondly, his district letter; and, thirdly, his name, thus:—

154	D	JAMES JACKSON.

This shows that James Jackson lives in district D, and his residence, &c., is found, if necessary, opposite the number 154 in the registry.

4. Appoint from the teachers and pious scholars as many visitors as districts, and, if possible, each visitor should reside in his own district. The person who examines the scholars should be one of the visitors.

5. Let every visitor have a ruled memorandum-book, labelled with his district letter.

6. At a convenient time, say after worship in every Sabbath afternoon, let the superintendent meet the district visitors

and the examiner, and cause every class-board to be brought separately before him, whence he enters the names of the absentees in the district books in conformity with the district letters attached to the names of each scholar.*

7. When the superintendent writes a child's name in a district visiting book, it signifies that the child should be visited during the week by such district visitor, and that the superintendent may know this on the following Sabbath, he must at the same time put down in the column L the day of the month with slate-pencil, opposite such child's name.

8. When the district visitors and the superintendent again meet on the afternoon of the following Sunday, the first duty of the superintendent is to look down column L, and see what scholars he directed to be visited, who were absent on the preceding Sabbath, and this he will know by the day of the month pencilled as directed in No. 7; he then inquires separately of their respective visitors, whom he knows by the district letters, the reasons why such children were absent, and writes them off in the board as ill, from home, &c. This arrangement takes but little time, and is an excellent method of seeing that the visitors have done their duty; it also gives the visitors an opportunity of mentioning to the superintendent any severe cases of sickness or distress which may have occurred to the parents or children in their districts, whose duty then is to visit such cases himself, or see that they receive proper advice or assistance. After the above preliminary, the fresh absentees are entered to be visited as directed in Nos. 6 and 7.

Rewards.

The design of the part of the board "F" is to form some safe criterion for rewarding children at the end of the year; and I do not know one more to be depended upon for this purpose than *regular attendance* at school, as the value of the rewards may always be proportioned inversely as the number of times absent. By this plan of rewards you give offence to no one, as you show no partiality, and you secure a better attendance of the children, who ought never to receive their marks of attendance unless they are either at school, or notice of illness has been sent to the superintendent by the parents of such absent children.

Independently of the "Visiting and Rewards," as stated above, the board will be found very useful to the managers and secretaries of Sunday Schools generally, and the teachers will in no manner be affected by the introduction of them into any school—as their duties will be exactly similar to what they at present perform, except marking in the part M the number of children in their respective classes, morning and afternoon. The boards have been used with success for nearly two years, and the result is decidedly a great saving of labour, trouble, and expense; in addition to a great increase of regularity and order. As it regards the economical disposal of the funds of a Sunday School, perhaps I ought to say that the first cost of each board would not exceed three shillings, if so much, and that less than half that sum would cover the expense of thirty boards for every subsequent year.

E. J. MITCHELL.

THE BRITISH ALMANAC.

Sir,—Having last year made a few remarks on the *British Almanac*, with a view to render future impressions more generally useful, but finding, by the contents of the almanac for 1833, nearly the same plan pursued, I beg leave to repeat my regret that so important a constituent of an almanac as the *sun's declination* should be again omitted. It can hardly be supposed that amongst the numerous purchasers of this almanac there are no astronomers, or persons who would take delight in making occasional astronomical observations: to all such persons the *British Almanac* is of little or no use, from the defect above alluded to.

If any person should be desirous of ascertaining the true time of day by the observed altitude of the sun, he must have recourse to other almanacs for the necessary data. If a surveyor wishes to mark the meridian line upon his plan, he can have no assistance from the *British Almanac*, but must refer to some other for the sun's declination. Nay, if he should be desirous of finding the true

* After a few weeks it will rarely be required to write the particular abode and parent's name of each absentee, as the visitors will then be familiar with the residences of those children who live in their respective districts.

time of the sun's rising or setting, he cannot do it by the *British Almanac*, although there are two columns appropriated to that object given in each month: he can only approximate the time by these tables, because the time varies according to the latitude, the elevation of the horizon, and to the sun's declination, as well as refraction. This almanac, having two pages for every month, might find room for the sun's declination without lessening its value on other points; for instance, the anniversaries of the births and deaths, which are not special to any year, might be placed, with other general matter, after the calendar. There is also nearly one-third of a page every month occupied with loose and indefinite astronomical phenomena, which might be more usefully filled with the particular places of the planets, at least five or six times in a month, by which essential data would be supplied for useful problems on the celestial globes, which, in many instances within my knowledge, are allowed to stand untouched for months, because the necessary data is not to be found in the *British Almanac*.

In looking over some of the particulars given in this almanac, it might be supposed intended for the use of those who study astronomy, for we find the eclipses of Jupiter's satellites; we have also the constellation in which the planets Mercury and Uranus may be found. I fear the compiler of this part has not well considered the subject, or he would not have occupied part of each month with matter so *entirely useless*, as no person will be able to see these bodies from such information; whereas if the right ascension and declination of the planets were occasionally given, the amateur astronomer might be able to find them. But I fear you will consider this paper too full of complaints.

Yours, &c.

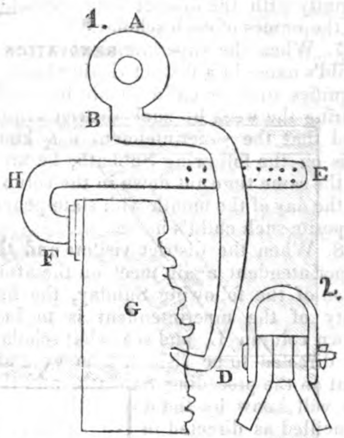
B. Bevan.

Leighton Buzzard.

APPARATUS FOR RAISING HEAVY WEIGHTS.

Mr. William Howard, Civil Engineer, has recently employed, in the erection of the M'Kim school at Baltimore, a hook or lever for raising stones, of a new construction, which he has found greatly superior to the common levers. We extract the following description of it from a letter of Mr. Howard's to the Editor of the *Franklin Journal*:—

Description.

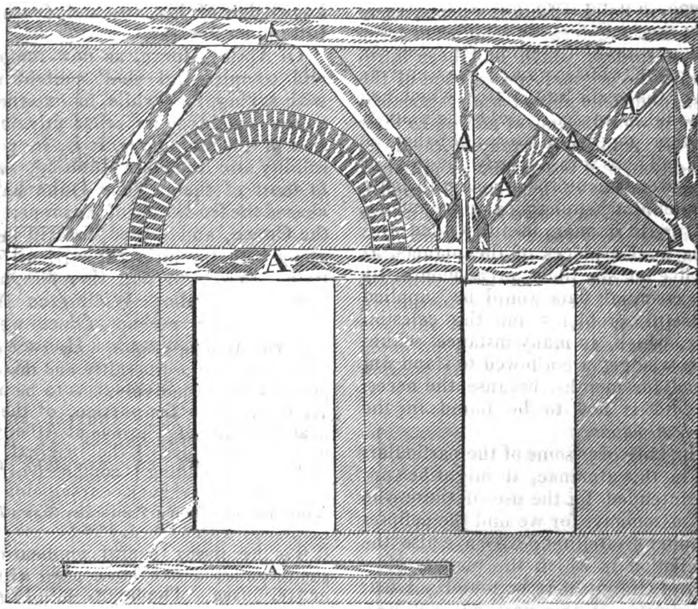


"The M'Kim school, now erecting at Baltimore by the liberality and taste of a public-spirited individual, is to be an exact copy, as to the portico, of the celebrated temple of Theseus at Athens, and of the precise size of the original. The body of the building is composed of blocks of granite ashler, each course being of the same height. To permit these blocks to be placed with accuracy and convenience, it was necessary to suspend each one in such manner as to leave its bed and sides entirely free. The lever, with two pins, represented in fig. 1, and similar to one described in Rondelet, *Art. de Batir*, was tried, and found to succeed very well, requiring only two holes to be bored about three inches deep, which can be done in the granite with great facility. Still it was desirable to avoid the labour of fitting this lever to more than 400 blocks; and the contrivance represented by fig. 2 was invented for the purpose, and has been found to answer perfectly. It consists of an iron bar, bent in the form A B C D, and of a size proportionate to the blocks of ashler intended to be raised. At C a mortise is made through it, admitting freely the bar H E. This bar is pierced with holes, as shown in the figure, through one of which an iron pin is put to prevent it from slipping towards H. At F is a plate attached to this bar, between which and the ashler block G a piece of wood is placed to keep the iron from injuring the worked face of the block. The end D forms a steel pin, which may be inserted about an inch in a hole bored in

the block; but in cases where the least projection or shoulder can be found for this point to catch hold of, this labour of boring is not necessary, the smallest prominence being sufficient to give the instrument a perfectly firm hold or gripe of the stone, which becomes still firmer as the weight comes to bear on it."

RENOVATION OF APSLEY HOUSE.

Fig. 1.



The circumstances attending the renovation of this splendid mansion being fraught with considerable instruction to practical men, the present brief notice of them has been drawn up by one who was employed in the work, in the hope that it may be deemed worthy a place in the pages of the Mechanics' Magazine.

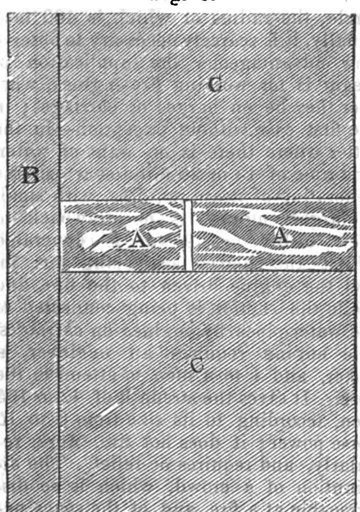
Apsley House was built in 1772; so that when the Duke of Wellington commenced his alterations upon it, in 1829, it was but fifty-seven years old. It was naturally supposed that the building was still in a perfectly substantial condition, and to the eye it had every appearance of being so; but on stripping off some of the external finishings, the architect (Mr. Benjamin Wyatt) discovered that it had been originally constructed in so *rubbishy* a style (no other word would adequately represent the real truth of the matter), that it was already in a state of most alarming dilapidation. Indeed, it seems next to a miracle, that so many Waterloo anniversaries should have been celebrated within its walls, unmarked by any fatal catastrophe; for certain it is, the Duke and his gallant Captains never faced worse dangers in the field, than they were unconsciously exposed to when engaged in these festive commemorations of their mutual triumphs.

In the first place, the walls were discovered to be chiefly composed of an extremely soft and inferior kind of brick, and very loosely and ill put together. Secondly, most of the walls on the level of the ground floor, as well as those on the level of the principal floor, were built on timbers about six inches thick, extending over the whole thickness of the walls, with the exception merely of an external half-brick casing; *which timbers were for the most part nearly reduced to*

dust, excepting where they contained hard knots; thereby leaving these walls, as it were, baseless, and *literally without any thing to support them* but the hard knots of the timber, and the external half-brick casing. Thirdly, in the very heart of the main wall, which separates the back rooms from the staircases, as well as in several other principal walls, at different heights from the floors, there were found the decayed remains of large pieces of timber, which had been introduced in the original construction of the walls, from some absurd and fantastical notion, it would seem, of adding to their strength! And lastly, many of the floors were rotten, and the girders or principal timbers of some of them were in such a state of decay, as to *have lost very nearly the whole of their bearing on the wall!*

The accompanying sketches may help to give a clearer idea of these different defects. Fig. 1 represents the manner in which timber was introduced into the walls, contrary to every sound principle of building. Fig. 2 shows the position

Fig. 2.



of the rotten timbers (A A), on which so many of the principal walls (C C) depended for support. The consequence of the ruinous state of decay in which the house was thus unexpectedly found was, that instead of some partial alterations, which were at first in contemplation for the purpose of connecting the main body of the building with the two new wings, a prodigious extent of heavy work, of a very costly description, was found indispensably necessary for the security of the house. The expense of this extra work has been estimated at not less than £10,000, the whole of which might of course have been saved, had the original constructor only possessed a little more knowledge of his art, and (perhaps) a little more honesty.

Of Apsley House, as now remodelled and completed, I shall content myself with saying, that while in external elegance it yields to no other private mansion in the metropolis, it is, in point of solidity and probable duration, superior to most of them. The Duke has purchased the fee-simple of the property from the Crown, and settled, that it shall go along with the title through all future time. Would it not, therefore, be well to call it henceforth Wellington House; or still better, perhaps, (since we have our Blenheim) Waterloo House?

H. W.

ACCOUNT OF THE ARRIVAL OF THE "COMET" FIRE-ENGINE AT BERLIN, AND OF THE EXPERIMENTS THERE MADE WITH IT.

(From the Allgemeine Preusische Staats-Zeitung, for Dec. 2, 1832.)

To the many useful applications of steam-power which have been witnessed of late years we have now to add that of working fire-engines by steam. The merit of having first manufactured such an engine is due to Messrs. Braithwaite and Co., of London. This machine, which consists of a 6-horse power steam-engine, and the pumps worked thereby, rests upon a carriage, which can easily be drawn by two horses, and, in consequence of the peculiar construction of the steam-boiler, can be brought into action in the course of thirteen minutes. Its effects are extraordinary; and its utility has been already exemplified at several large fires in London, among which may be mentioned the Argyll Rooms in Regent-street—English Opera House, Strand—and, lastly, the celebrated brewery, of Messrs. Barclay, Perkins, and Co. On the last occasion the engine particularly distinguished itself; and after the fire, and the total loss of the steam-engine and pumping-apparatus, it was of extraordinary service to the proprietors of the

brewery in pumping, for 25 days, the beer brewed in the part of the building that was saved, to the vats, 50 feet above the level of the street.

As the doub'e-acting pump of the engine, which is worked by a 6-horse steam-engine, is 6½ inches diameter, and makes 30·14 inches double strokes per minute, it can pump in a day of 10 hours, 8,640 cubic feet, and, in 25 days, 216,000 cubic feet, English measure, to the height of 50 feet.

The Prussian Ministry of the Interior for trade, traffic, and building, has had a similar engine, but of still greater power, made by Messrs. Braithwaite and Co. It works by an engine of 15-horse power, and is the first of its size, made at their manufactory. The makers have named it the "Comet." There were several trials made of it to-day on the Building-ground of the Court-marshall office, in University-street, which proved equally satisfactory with those made for two whole days at London. The engine consists of two horizontal 10 inch double-acting pumps, which are worked by two small steam engines of the united power of 15 horses. The pumps, engines, and boiler, with connectors, rest on four of Jones's (of London) patent wheels, (cast-iron boxes, with wrought-iron spokes and rims,) and can, notwithstanding the immense weight of 4 tons (when the boiler is charged), be easily drawn by four horses on a paved road. Those patent wheels are on the same principle as those with which the Artillery Company at Woolwich have made, according to the *United Service Journal*, such satisfactory experiments. In the course of 20 minutes from lighting the fire in the boiler, the engine was started, and made then 20 to 25 strokes per minute. The pumps being 10 inches diameter, they will draw, with 25·14 strokes, 57 cubic feet per minute, or 3,130 cubic feet per hour, and throw it through the hose to great heights and distances. To the air-chamber there may be fixed 4 sets of hose, which can be used together or separately. By using one hose, and a jet of 1¼ inches diameter, the water was thrown vertically to the surprising height of 120 feet; and at an angle of 45° to 50°, to a distance of 164 feet. The effects of this engine are accordingly very great, and can even be increased by giving it a quicker stroke. The engine is destined, in particular, for the protection of the Royal Palace, the Cathedral, Museum, new Sufferance-warehouses and court-house, the Governor's Palace, his Majesty's Palace, that of her Grace the Princess of Lignitz, the Life-guard House, the Finance Ministry Office, the Academy for Singing, the University, the palaces of the Queen of the Netherlands and of his Royal Highness Prince William, the Library, the office of the Minister of the Interior for Trade, &c., the Opera House, and the Royal buildings in Burg-street.

For the supply of the great quantity of water necessary for the engine, cast-iron suction-pipes are to be laid under the pavement, with plugs to which the suction of the engine may be fixed. In consequence of this arrangement the engine may be used as well for extinguishing fire itself as for supplying other engines with water. As there are 400 feet of hose belonging to it, the water may even by that means be conveyed to great distances; and a large plane may be protected by placing the engine into a circle, the radius of which is 400 feet. Finally, it is scarcely necessary to observe how advantageous the application of steam is for working fire-engines, whether they be on barges or carriages; in the first case without exception—in the latter where there is no want of water. The time of 13 or 20 minutes which the generating of steam requires, with small or larger engines, is no drawback to their utility, as steam is generated whilst the horses are being put in, and the engine driven to the fire, and while the suction is being connected to the water-pipes by engines on carriages. The engine requires an engineer, a stoker, and 1 to 4 men to attend to the hose. It saves the strength of 42 to 105 men, according to its size from 6 to 15 horse power; it does not tire, works regularly, and requires no relief. The diminution of a crowd, which is so disagreeable at a fire, and of the space necessary for many small engines—the greater distance from the fire in which this engine may be placed, and the simplification of directing firemens' exertions, are certainly undeniable advantages. If, therefore, even the application of steam fire-engines by land may be

with us but small, as sufficient water can only be produced near rivers or canals (there being no waterworks,) the utility of these engines must call for their general adoption in barges, where there is no such impediment.

DESCRIPTION OF RUTTER'S NEW OXY-HYDROGEN BLOW-PIPE.

(Communicated by the Inventor.)

I have caused to be constructed by Messrs. W. and S. Jones, 30, Holborn, an apparatus which is more simple, and, at the same time, more effective, than either Clarke's or Gurney's blow-pipe, and it possesses also the additional advantage of being *perfectly safe*. The most timid or nervous experimenter may use this instrument without the slightest apprehension of explosion. With ordinary precautions such an occurrence is absolutely impossible.

In using Clarke's and Gurney's blowpipes it is well known that the gases are mixed in their due proportions previously to charging the respective reservoirs. In this consists principally their insecurity; to obviate which I condense the gases in separate vessels, and they are not mixed until in a state of combustion.

With the exception that the vessels I employ are considerably larger than usual, I may describe my apparatus as consisting of two of Clarke's blow-pipes, fixed parallel to each other on a mahogony slab, the jets being inclined at their junction so as to form an angle of 5°, and separated by a partition $\frac{1}{50}$th of an inch thick. The orifices of the respective jets are considerably larger than in those commonly employed. The dimensions of the vessels are as follows:—That for hydrogen (marked Hyd.) 10 inches long by 5 wide, and 4 deep; that for oxygen (marked Oxy.) of half the capacity of the former, viz. 10 inches long, $2\frac{1}{2}$ wide, and 4 deep. It is important that the copper vessels be made very strong, and perfectly sound; this is the greatest difficulty I have had to contend with. I can condense with a 9-inch syringe from 800 to 1000 cubic inches of hydrogen gas into the largest vessel, and about half that quantity of oxygen into the vessel appropriated for its reception. That there can be no necessity for safety-valves, safety-tubes, wire-gauze, water, or oil, or mercurial chambers, must be apparent to every one whom this communication may concern. They are, consequently, dispensed with.

The tubes which convey the gas from the respective vessels have each two stopcocks to regulate the escape. A very little practice enables the operator to determine the quantity so as to produce the maximum of heat. I do not believe that the utmost attention to the relative bore of the jets would of itself accomplish the desired effect. It implies conditions which cannot easily be complied with. I allude to the uniformity of pressure within the vessels. The habits of the two gases are very dissimilar, and their escape in equal times corresponds in some degree with their densities.

The usual experiments, as performed by the aid of the apparatus I have thus imperfectly described, are, if I may be allowed the use of the term, *infinitely* more splendid and more impressive than can be effected by any other means with which I am acquainted. The lime experiment, especially, is inconceivably brilliant, exhibiting a disc of pure white light at least $1\frac{1}{4}$ inch in diameter. With a piece of clock-spring I have filled an area of 3 feet diameter with the most beautiful corruscations.

The advantages of this apparatus may be thus enumerated:—It is perfectly safe. A label, or a piece of coloured tape, attached to the bladders containing either the hydrogen or the oxygen, will be a sufficient security, with ordinary caution, against any mixture of the gases. If the gases be kept separate it is impossible they can explode. The capacity of the vessels enables the operator, with two or three charges, to go through a whole course of illustrative experiments in the lecture-room. The instrument is more powerful and striking in its effects than any other, and is hence the better adapted for a large room.

Dr. Faraday has informed me that about the time Clarke's blow-pipe was invented, an instrument, somewhat similar to mine was shown him, and was, he believes, described in the *Philosophical Magazine*. But as that instrument consisted of one vessel only, divided by a diaphragm, there was no security against explosion, since the gases could mix in either chamber by a defect in the solder-

ing or in the metal. I had never heard of this contrivance till it was mentioned to me by the gentleman above-named.

I have used Clarke's blow-pipe many times without the least accident; but I think it is difficult to do so apart from something like terror creeping over the imagination. In the hands of the careless or the unskilful it is exceedingly dangerous.

It has occurred to me that vessels of sufficient strength and capacity may be constructed, in which a store of gas could be kept at the most important light-houses, to be used in thick weather, in furtherance of Lieutenant Drummond's plan.

I shall have great pleasure in furnishing any other information that may be required in connexion with the oxy-hydrogen blow-pipe.

J. O. N. RUTTER.

Lymington, Hants, Dec. 5, 1832.

MR. BABBAGE'S CALCULATING MACHINERY.

The great Pascal was the first who succeeded in reducing to pure mechanism the performance of a variety of arithmetical operations, and a description of the instrument by which he effected this object is to be found in the fourth volume of the *Machines Approuveés* of M. Gallon. In 1673 Sir Samuel Morland published an account of two different machines which he had invented, one for the performance of addition and substraction, and the other for that of multiplication, without, however, developing their internal construction. About the same period the celebrated Leibnitz, the Marquis Poleni, and M. Leupold, directed their attention to the subject, and invented instruments for accomplishing the same purpose by different methods. Leibnitz published his plan in the *Miscellanea Berolensia* of the year 1709, giving, however, only the exterior of the machine; and Poleni communicated an account of his to the same work, but also explained its internal construction. Both of these machines, together with that of Leupold, were subsequently described in the *Theatrum Arithmetico-Geometricum* of the latter, published at Leipsic in 1727. We must not omit to mention the *Abaque Rhabdologique* of M. Perrault, inserted in the first volume of the work, which we have referred to above, the *Machines Approuveés*, by the Paris Academy, which contains also an account of a *Machine Arithmétique* of M. Lespine, and of three distinct ones of M. Hillerin de Boistissandeau. In 1735 Professor Gersten, of Giessen, communicated to the Royal Society of London, a very detailed description of an instrument of this nature which he had invented, and the hint of which, he says, "I took from that of M. de Leibnitz, which put me upon thinking how the inward structure might be contrived."

Notwithstanding the skill and contrivance bestowed upon these instruments, their power is necessarily but very limited, and they bear no comparison, either in ingenuity or magnitude, to the grand design conceived, and nearly executed, by Mr. Babbage. Their very highest functions were but to perform the operations of common arithmetic. Mr. Babbage's engine, it is true, can perform these operations, it can also extract the roots of numbers, and approximate to the roots of equations, and even to their impossible roots; but this is not its object. Its function, in contradistinction to that of all other contrivances for calculating, is to embody in machinery the method of differences, which has never before been done; and the effects which it is capable of producing, and the works which, in the course of a few years, we expect to see it execute, will place it at an infinite distance from all other efforts of mechanical genius. Great as the power of mechanism is known to be, yet we venture to say, that many of the most intelligent of our readers will scarcely admit it to be possible, that astronomical and navigation tables can be accurately computed by machinery; that the machine can itself correct the errors which it may commit; and that the results, when absolutely free from error, can be printed off without the aid of human hands, or the operation of human intelligence. "All this, however," says Sir David Brewster, in his entertaining *Letters on Natural Magic*, "Mr. Babbage's machine can do; and, as I have had the advantage of seeing it actually calculate, and of studying its construction with Mr. Babbage himself, I am able to make this statement on personal observation." It consists essentially of two parts, a calculating, and a printing part, both of which are necessary to the fulfilment of the inventor's views, for the whole advantage would be lost if the computations made by the machine were copied by human hands, and transferred to types by the common process. The greater part of the calculating machinery, of which the drawings alone cover upwards of 400 square feet of surface, is already constructed, and exhibits workmanship of such extraordinary skill and beauty, that nothing approaching to it has hitherto been witnessed. In the printing part, less progress has been made in the actual execution, in consequence of

the difficulty of its contrivance, not for transferring the computations from the calculating part to the copper, or other plate destined to receive them, but for giving to the plate itself that number and variety of movements which the forms adopted in printed tables may call for in practice.

The practical object of the calculating engine is to compute and print a great variety and extent of astronomical and navigation tables, which could not otherwise be done without enormous intellectual and manual labour, and which, even if executed by such labour, could not be calculated with the requisite accuracy. Mathematicians, astronomers, and navigators do not require to be informed of the real value of such tables; but it may be proper to state, for the information of others, that *seventeen* large folio volumes of logarithmic tables alone were calculated under the superintendance of M. Prony, at an enormous expense to the French government; and that the British government regarded these tables to be of such national value, that they proposed to the French Board of Longitude, to print an *abridgement* of them at the joint expense of the two nations, and offered to advance £5,000 for that purpose. But, besides logarithmic tables, Mr. Babbage's machine will calculate tables of the powers and products of numbers, and all astronomical tables for determining the positions of the sun, moon, and planets; and the same mechanical principles have enabled him to integrate innumerable equations of finite differences; that is, when the equation of differences is given, he can, by setting an engine, produce at the end of a given time, any distant term which may be required, or any succession of terms commencing at a distant point.

On the means of accomplishing this, we need make no apology for quoting Mr. Babbage's own words. "As the possibility of performing arithmetical calculations by machinery may appear to non-mathematical readers too large a postulate, and as it is connected with the subject of the division of labour, I shall here endeavour, in a few lines, to give some slight perception of the manner in which this can be done; and thus to remove a small portion of the veil which covers that apparent mystery. That nearly all tables of numbers which follow any law, however complicated, may be formed, to a greater or less extent, solely by the proper arrangement of the successive addition and subtraction of numbers befitting each table, is a general principle which can be demonstrated to those only who are well acquainted with mathematics; but the mind, even of the reader who is but very slightly acquainted with that science, will readily conceive that it is not impossible, by attending to the following example. Let us consider the subjoined table. This table is the beginning of one in very extensive use, which has been printed and reprinted very frequently in many countries, and is called a table of square numbers.

Terms of the Table.	A. Table of squares.	B. First Difference.	C. Second Difference.
	1		
		3	
2	4		2
		5	
3	9		2
		7	
4	16		2
		9	
5	25		2
		11	
6	36		2
		13	
7	49		

Any number in the table, column A, may be obtained by multiplying the number which expresses the distance of that term from the commencement of the table by itself; thus 25 is the fifth term from the beginning of the table, and 5 multiplied by itself, or by 5, is equal to 25. Let us now subtract each term of this table from the next succeeding term, and place the results in another column (B), which may be called first-difference column. If we again subtract each term of this first-difference from the succeeding term, we find the result is always the number 2 (column C); and that the same number will always recur in that column, which may be called the second-difference, will appear to any person who takes the trouble to carry on the table a few terms further. Now, when once this is admitted as a known fact, it is quite clear that, provided the first term (1) of the table, the first term (3) of the first differences, and the first term (2) of the second or constant difference are originally given, we can continue the table to any extent, merely by simple addition: for the series of first-differences may be formed by repeatedly adding the constant difference 2 to (3) the first number in column B, and we then necessarily have the series of odd numbers, 3, 5, 7, &c.; and again, by successively adding each of these to the first number (1) of the table, we produce the square numbers."

Having thus thrown some light on the

theoretical part of the question, Mr. Babbage proceeds to show that the mechanical execution of such an engine as would produce this series of numbers, is not so far removed from that of ordinary machinery as might be conceived. He imagines three clocks to be placed on a table, side by side, each having only one hand, and a thousand divisions instead of twelve hours marked on the face; and every time a string is pulled, each strikes on a bell the numbers of the divisions to which the hand points. Let it be supposed that two of the clocks, for the sake of distinction called B and C, have some mechanism by which the clock C advances the hand of the clock B one division for each stroke it makes on its own bell; and let the clock B by a similar contrivance advance the hand of the clock A one division for each stroke it makes on its own bell. Having set the hand of the clock A to the division I, that of B to III, and that of C to II, pull the string of clock A, which will strike one; pull that of clock B, which will strike three, and at the same time, in consequence of the mechanism we have referred to above, will advance the hands of A three divisions. Pull the string of C, which will strike two and advance the hand of B two divisions, or to division V. Let this operation be repeated; A will then strike four; B will strike five, and in so doing will advance the hand of A five divisions; and C will again strike two, at the same time advancing the hand of B two divisions, Again pull A, and it will strike nine; B will strike seven, and C two. If now those divisions struck, or pointed at by the clock A, be attended to and written down, it will be found that they produce a series of the squares of the natural numbers; and this will be the more evident if the operation be continued farther than we have carried it. Such a series could of course be extended by this mechanism only so far as the three first figures; but this may be sufficient to give some idea of the construction, and was in fact, Mr. Babbage states, the point to which the first model of his calculating engine was directed.

In order to convey some idea of the power of this stupendous machine, we may mention the effects produced by a small trial engine constructed by the inventor, and by which he computed the following table from the formula x^2+x+41. The figures as they were calculated by the machine, were not exhibited to the eye as in sliding-rules and similar instruments, but were actually presented to it on two opposite sides of the machine, the number 383, for example, appearing in figures before the person employed in copying. The following table was calculated by the engine referred to:

41	131	383	797	1373
43	151	421	853	1447
47	173	461	911	1523
53	197	583	971	1601
61	223	547	1033	1681
71	251	593	1097	1763
83	281	641	1163	1847
97	313	691	1231	1933
113	347	743	1301	2021

While the machine was occupied in calculating this table, a friend of the inventor undertook to write down the numbers as they appeared. In consequence of the copyist writing quickly, he rather more than kept pace with the engine at first, but as soon as five figures appeared, the machine was at least equal in speed to the writer. At another trial, thirty-two numbers of the same table were calculated in the space of two minutes and thirty seconds, and as these contained eighty-two figures, the engined produced thirty-three figures every minute, or more than one figure in every two seconds. On a subsequent occasion, it produced 44 figures per minute; and this rate of computation could be maintained for any length of time. — *Partington's British Encyclopædia.*

THE LONDON ARCADE.

Sir,—In No. 485 of your valuable Magazine, published Nov. 24, you have been pleased to notice my project for an arcade from the north end of Bartholomew-lane to London Wall. I should not have obtruded myself on your notice had the remarks you made been correct. Allow me to say, that in the plan which I published in 1827 for approaches to the London Bridge (contrary to the wish of the London Bridge Committee), I laid down a line for a new street from Lothbury to Moorgate; and instead of the Corporation of London having determined shortly to commence carrying it into execution, I regret to say, they have determined not to do so, and have purchased the house at the corner of Coleman-street and Lothbury, for the purpose of facilitating the ingress and egress of coaches and omnibuses to Princess-street and Bartholomew-lane. *Princess-street will be widened according to my plan.* One chief feature in my arcade project is, to afford carriages the opportunity of taking up and setting down their passengers at the entrance of the arcade in London Wall, and

thus relieve the Bank and Royal Exchange from the great inconvenience occasioned by congregating around them. Permit me to observe, that a petition has been presented to the Lord Mayor, Aldermen, and Common Council, praying their concurrence with my project of an arcade, which was carried in the affirmative, and is recorded on the journals of the Court.

I am, Sir,
Your very obedient servant,
PETER JEFFERY.

London, Dec. 13, 1832.

ANSWERS TO INQUIRIES.

THE PROCESS OF HEATING BY HOT WATER has been repeatedly described in this Journal. W. may consult, in particular, the Mech. Mag. for March 3, May 12, May 19, and August 4, 1832. It matters not whether the building is of one or half a dozen stories; nor are we aware of any patent that would interfere with W.'s projected operations. He had better, however, examine the specification of the peculiar process for which Mr. Busby has a patent, given in Mech. Mag. for July 14, 1832.

ALGEBRA.—J. V. W. wishes to know "the best elementary work on algebra for self-tuition?" In answer to a similar inquiry on a recent occasion, (Mech. Mag. Oct. 6, 1832,) we recommended Sanderson, or Euler translated by Barlow; but we observe that a much better authority on such a point (Professor Leslie) pronounces Maclaurin's Elements of Algebra to be, "though a posthumous work, perhaps the ablest on the whole, and the most complete."—*Dissertation on the Progress of Mathematical and Physical Science.*

DRY ROT.—If Mr. Kyan affects to make a secret of his patent mode of preserving timber from the dry rot, as "Perthensis" informs us he does, he plays a very foolish part; for he must either pretend to conceal what he has already revealed to all the world, by his specification, or he has not given that full and explicit specification of the process which the law requires, and in that case his patent will have been rendered null and void. We shall look into the matter, and report the result, in all probability, next week.

OGLE AND SUMMERS' STEAM-CARRIAGE.—S. P. W. asks, "What has become of Ogle and Summers' carriage since it was last heard of at Oxford? Has it, like Hancock's, come to a dead stop, and been housed by the way-side? Or how else?" The last intelligence we had of the carriage in question was that it had arrived in London from Liverpool after a journey of only *fifteen* days' duration, and that to put an end to all Cockney doubts of its amazing capabilities as a LOCOMOTIVE engine, it is intended to exhibit it at some show-shop in the west end of the town, in what our friend Saxula would call a *statu-motive* attitude, namely, with the steam up, but the wheels left free to work against the air only. Why does it not begin at once to ply for hire in the public streets of London? One week's practical demonstration of this sort would be worth a thousand such toylike exhibitions.

MISCELLANEOUS.

Imprints.—It is important, if possible, always to connect the name of the workman with the work he has executed; this secures for him the credit or the blame he may justly deserve; and diminishes in some cases the necessity of verification. The extent to which this is carried in literary works published in America is remarkable. In the translation of the *Mecanique Celeste* by Mr. Bowditch, not merely the name of the printer, but also those of the compositors, are mentioned in the work.—*Babbage's Economy of Manufactures: Second Edition.*

Joseph Bramah was born on a farm belonging of the last Earl of Strafford at Stainborough, in the parish of Silkstone, Yorkshire. When very young, and being at that time principally employed about the farm with his parents, he showed a wonderful fondness for constructing musical instruments. When he was sixteen years of age he became lame, so as to be unfit any longer for the duties of farming, and was bound to a carpenter in the village. He worked at this trade with pleasure, and when his time was out he felt his power to be so much above all competition where he was, that he went to London and set up as a cabinet-maker.—*Tradesman's and Mechanics' Almanac.*

A Living Lamp.—The aborigines of South America, in the *fire-fly* (the *elater noctilucus*) had a *living lamp* provided for them by Divine Beneficence, which, supplied from itself, required no art to trim it, no combustible material to feed it. Eight or ten of these insects afford light equal to that of a candle: they illuminate the house—they serve to direct the traveller. On Sir Thomas Cavendish and Sir Robert Dudley landing in the West Indies, they were struck with astonishment at the moving lights of these curious insects in the woods, and, impressed with the idea that the Spaniards were advancing, precipitately returned to their ships.—*The Voice of Humanity, No. X.*

The Royal Society.—At the anniversary dinner of this Society, on St. Andrew's Day, Mr. Lubbock gave the health of the Duke of Sussex, the President, in highly encomiastic terms, and protested that the Society had never prospered better than under the auspices of his Royal Highness. Mr. Babbage, on the contrary, affirms, in his work on Machinery and Manufactures, that "the evils which were anticipated from his election have not proved to be imaginary, while the advantages by some expected to result from it have not yet become apparent." Which are we to believe? For our own parts, we should willingly give credence to Mr. Lubbock, were it not contrary to all experience of human nature to suppose, that any body of learned men could flourish under an usurpation, of which servility is the basis, and empty titles the superstructure.

INTERIM NOTICES.

"Lambda's" letter, though smartly written, is not of a nature to be published on anonymous authority.

Y. E.—Declined.

"Old Saw" must wait a little. We think Mr. Downing entitled to be next heard, and we have in hand another clever paper from his pen.

Communications received from Mr. Locke.—W. H.—Audax—O. K.—V. A. S.—T. W.—Phaeton.—W. L. M. E.—Mr. Wm. Pearson.—F. M.

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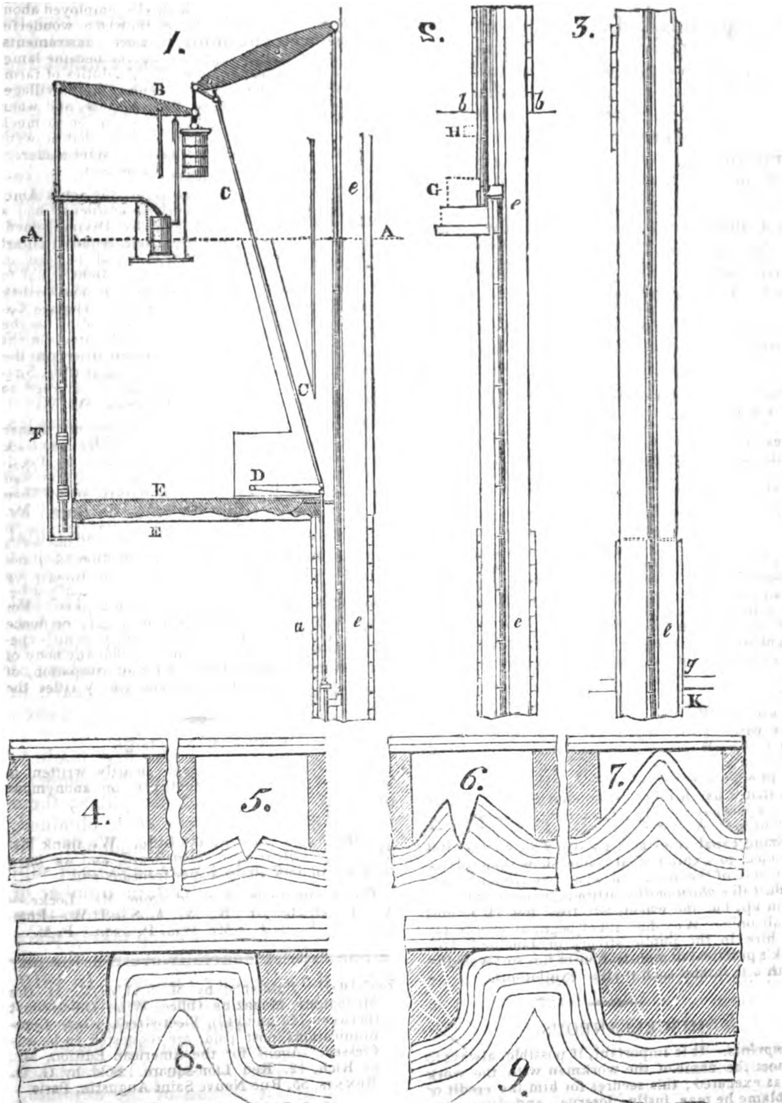
THE NORTH OF ENGLAND MODE OF WORKING COAL-MINES.



MODE OF WORKING THE COAL-MINES OF NORTHUMBERLAND AND DURHAM.

Sir,—I have read with much interest the various papers which have appeared in your instructive Magazine on the ventilation of coal-mines, having myself a considerable stake in the hedge; but I am inclined to think the subject must still seem to your general readers invested with a good deal of obscurity, from their not having had first placed before them a distinct account of the modes which have been hitherto adopted in the working of coal. I therefore propose to devote a spare hour to the task of gleaning from the different Parliamentary Reports on the Coal Trade, and particularly from the evidence of Mr. Buddle, the most intelligent and experienced coal-master in the kingdom, the following particulars of the practice followed in the northern coal-districts:—

The principal accidents to which coal-mines are subject are, 1st. drowning by water; 2d. the falling in of the superincumbent strata, called the creep; and, 3d. explosions.

1. To dam out the water—which in some parts of the stratification, particularly between 40 and 50 fathoms from the surface, is often encountered in immense quantities—they employ what is called a tub, but which is, more properly speaking, a cast-iron caisson. The accompanying sketches, figs. 1, 2, and 3, (see front page) exhibit a section of a pit, which was sunk by Mr. Buddle with 40 fathoms of cast-iron tub in it. A A is the outset surface. B, double-power pumping-engine, of which C C is the diagonal rod, and D the valve-bob. E E, a drift. *a a a* shows the tub, which dams up the water from the impervious stratum at *b b* to the drift E E, from whence it is drawn by the pump F. A partition of planking, *e e e e*, separates the engine-shaft from the coal-shaft; this portion is air-tight, and forms the pit into a down-cast and an up-cast shaft to ventilate the workings below. The current of air descends the engine-shaft and ascends the coal-shaft, near the bottom of which a large furnace is placed for the purpose of rarefaction. G is the cistern. H, bucket-door. g, seam of coal, entrance into the workings. K, pump-well. At 40 fathoms the strata of this shaft became perfectly impervious to water. It sometimes happens that the tub or caisson breaks, in which case the rushing in of the water commonly drowns the mine, and causes an entire suspension of the works till the tub can be repaired and the water pumped out.

2. The nature of the creep will be at once understood by an inspection of the figures, 4, 5, 6, 7, 8, and 9, which show the progress of this evil from its commencement until it has completely closed all the workings and crushed the pillars of coal. The black parts represent the coal-pillars between each gallery; when these are weakened too much, or, in other words, when their bases become too narrow for the pavement below, by the pressure of the incumbent stratification, they sink down into the pavement, and the first appearance (fig. 4) is a little curvature in the bottom of each gallery; that is the first visible symptom, but the miners can generally hear it before they perceive it. The second stage (fig. 5) is when the pavement begins to open with a crack longitudinally. The next is (fig. 6) when that crack is completed, and it assumes the shape of a metal ridge. The next is (fig. 7) when the metal ridge reaches the roof. The next (fig. 8) when the peak of the metal ridge becomes flattened by pressure, and forced into a horizontal direction and becomes quite close; just at this moment the coal-pillars begin to sustain a part of the pressure. The last stage (fig. 10) is when it is dead, or settled, that is, when the metal ridge, or factitious ridge formed by the sinking of the pillar into the pavement, bears, in common with the pillars of coal on each side, the full pressure.

In 1795 an attempt was first made to work the pillars themselves, by removing one-half of every alternate pillar; there was from 50 to 60 per cent. obtained, and the rest was totally abandoned. In this state the pillars were capable of supporting the roof to a certain number of acres, 20, 30, or 40; but the bottom then began to yield, and a creep taking place in one district generally overran the pillars in the adjoining districts. In 1810, another improved system was introduced: the coal mines were exhausting so very rapidly, that an attempt was made, by which every intermediate pillar was taken out, and also a portion of the adjoining ones. By this plan they succeeded, by

Fig. 10.

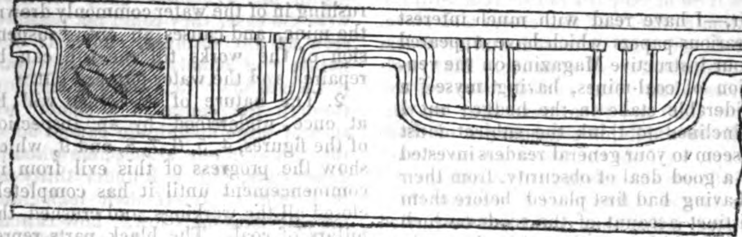


Fig. 11.

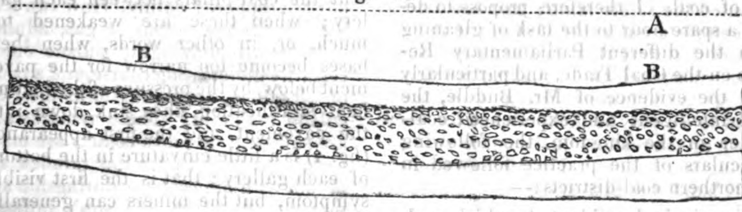
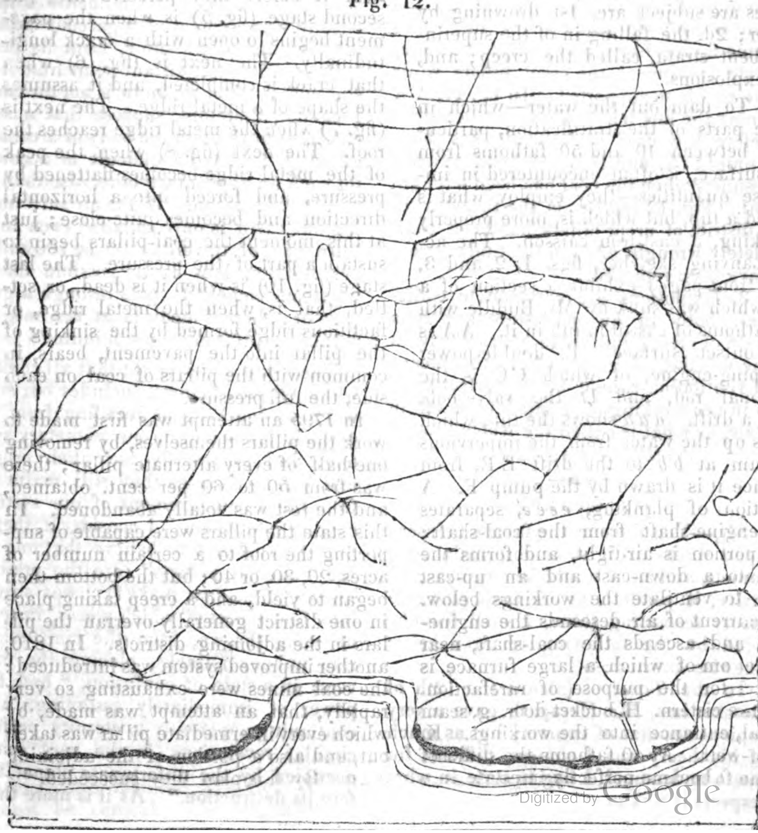


Fig. 12.



working in small divisions, in obtaining about 80 or 90 parts out of 100. Still the ultimate effect was, that creeps took place, the danger was increased, and great loss of coal was the consequence. Many collieries about that period, between the years 1800 and 1815, were shut up partially or wholly, in consequence of these creeps, as from the great accumulation of inflammable gas in all old workings, and the danger and expense of working them by steel mills, they could not be carried on. In 1815 Sir Humphry Davy invented the safety lamp; that operated as a complete renovator of many of the collieries that were then in a state of exhaustion, inasmuch as it enabled the miners to set the inflammable gas at defiance, and to employ artificial means for propping up the roof, while the entire coal was being worked out. Fig. 10 shows on the left hand the first stage of the process, which was then adopted, of digging through the rubbish and introducing timber props to support the roof. The same figure shows, on the right, the complete working of the crept pillars, while the roof is so supported. In fig. 11, A A shows the line which the surface exhibits before the coal underneath has been wrought off, and B B the bend which it assumes when the coal has been wrought out. Fig. 12 represents the thrust after a district of crept pillars has been completely wrought off, and the timber props have been removed.

3. Explosions are common to collieries, both in an open state and in a state of creep, but more particularly in the working of creeps, where the means of ventilation cannot be so perfect as it is in the working of a mine in a virgin state, or what is called the whole mine.

(To be concluded in our next.)

ON COMETS.

Sir,—You did me the favour to insert, a few weeks back, some observations on comets, and as it would be gratifying to arrive, if possible, at the most probable theory respecting them, I shall feel obliged by the following remarks being likewise inserted:—

In the *Times* of (about) the 12th of October last, Mr. Herapath gave a very copious account of comets; but as much of his theory was, I confess, difficult for me to understand, I beg to state in what respects it was so.

In the 1st place, comets are, according to Mr. H., mere gas; but if such were the case, they could not possibly be seen at any distance. 2dly. If of the nature "of clouds or fogs," how would it be possible "to discern a small star through the centre of a comet" when stars of large magnitude cannot be seen through even our atmosphere when in a dense state, although under thirty miles in height. 3dly. If their temperatures are so "extremely low," how can they, as asserted, increase the temperature of our atmosphere? 4thly. How can a collection of mere vapour or gas, admitted to be "extremely light," pursue one necessarily undeviating course, and a course, of all others, apparently to us most difficult to maintain? These remarks alone are sufficient to prove comets are matter, certainly not gas; for the rarefied state of our own atmosphere during the summer months, from the sun's influence, conveys an idea of the immense difference in size a comet of a gaseous nature must continually assume, from its perihelium to its most distant point from the sun, which effect we know is not the case. I cannot, therefore, suppose that a star can be seen through the body of a comet, although it may be difficult to account for such an appearance otherwise than as an optical illusion. If the air surrounding our earth is only capable, even in a hurricane, of travelling 90 or 100 miles per minute, how is it possible for a "gaseous comet" to pass through a gaseous or ethereal medium at the rate of "1200 or 1400 miles per minute?"

There can be no doubt that all comets whose elliptical circuit includes our sun, when approaching or receding from its perihelium, belong to our planetary system, and necessarily took their origin and precise courses they still maintain from the commencement of our system coming into action. I consider it, therefore, inconsistent to believe that one of the "ancient planets" (are the present known of *modern* make?) "was struck into four pieces;" which pieces, instead of being thrown, from the concussion, into unknown tracks, placing the universe in a state of confusion, "had the power of immediately assuming, and continuing apparently to eternity, perfect circular revolutions, in the very space occupied by the unfortunate planet before its destruction." As it is more than

probable that all comets, whose route is within the sphere of our system, must have made before this period many revolutions, whether seen or not by the inhabitants of this globe, so is also placed beyond probability the idea of this or any other planet in such system being struck by a comet. The very idea, supposing such an event possible, conveys the greatest horror the mind of man can contemplate. The collision of a comet with the earth would hurl villages, cities, and seas, with every living object, from their beds, to unknown regions and destruction. Such an event would cleave probably the earth into many chaotic masses; but never can it be imagined that, with such a fortuitous event, those unshaped fragments of a world could immediately commence a fresh revolving course, "that the space allotted to the former planet might not be left vacant." But the above calamitous event could only be caused by a material comet. A gaseous one, if such existed, could only sweep from the earth's surface all moving opposing objects. I think it may be justly maintained that a planet never has and never will be destroyed by either a comet or any other body, unless from the intention, of all bodies forming the universe, of being destroyed by the Creator of all; for I feel persuaded that no theory of attraction or circulating medium could persuade unshaped masses of a destroyed planet to begin and pursue courses unmoved in by other planets. Such reasoning would be strange indeed. There is too much "chance" in such a scheme to render it probable. All comets disposed in our system must have taken their origin with the planets, and no doubt were created for a specific purpose,—whether to afford occasional heat to the extreme planets, or to purify the medium through which they pass, is at present totally unknown.

I think comets are material bodies in a state of combustion; and that their nebulosity or surrounding atmosphere is proportionately dense or foggy from contingent circumstances, but perpetually caused by the perpetual combustion of the comet, which must therefore be considered its constituent principle, to produce some necessary effect. The tail or train is caused by the refraction of light from the nucleus or body of the comet through the atmospheric medium, and, from velocity, must be conical. The length of tails, from their apex to the base or circumference of the nucleus, must be in proportion to the size of the nucleus or body of the comet. But it is apparent, that to our sight the general appearances of comets must vary considerably, depending on the relative positions or routes of the earth and comets. The extensiveness of atmospheres, whether of comets or of planets, must depend on their nature and state, as well as distance from the sun. I think reason dictates that, if the original order of motion given to the celestial bodies was, either by attraction, the ethereal medium, or any other secondary cause, capable of being retarded or accelerated, in effect to alter their courses, annihilation of the universe must have followed long before this period, from the certain derangement that must have followed.

It is said that seasons can be affected without the earth's temperature being also affected, which I do not comprehend; for it would appear that the latter influences the former. The temperature of our atmosphere is, I think, affected by the approach and departure of comets of large size, and at their nearest point, or rather, when nearest the earth. The mean temperature for the year may not be greater in consequence; it may even be less than when we are not visited by any comet. M. Arago is correct in saying that a comet may pass through our orbit without injury to it or the earth; for although the former describes an immense circle, it is not a road of course, but a mere imaginary line described by the earth; and the latter may be far removed from the comet when so passing. I wish to inquire how it is known that the sun exercises any attractive principle upon the planets, as asserted by M. Arago and others; for, as our earth maintains a precise course, any attractive influence from the body it passes round, it appears to me, would necessarily draw the earth to such body, and be consumed by it.

I also differ from M. Arago in his thinking that some comets are without nuclei, for I think it is the absolute body of the comet by which the nebulosity is caused, and through which latter alone a star can be seen occasionally. I think (certainly in opposition to most theories) that the sun has little or no influence over comets or planets as regards attraction; for if it had, the axis of the tail

would be in a right line with the nuclei and sun; besides which the comet could not pass from the sun to continue its orbit: the latter is never the case; and as to the former, the apex must always be in a right line with the centre of the nuclei and the point of approach, the tail always of course following. If a comet approaches the earth in a right line, the inhabitants upon one part will not be able to see the tail, while those upon the opposite side must see it obliquely. In answer to M. Arago, I should say comets are luminous from having the tail. Planets are not luminous bodies,—therefore have no tails, but merely reflect the sun's rays; but I do not see how a luminous body can reflect the light of other bodies, that is, supposing each possessed of primitive light; for light absorbs light, and cannot therefore reflect it.

In answer to Buffon's theory on the formation of the planets—if comets are so extremely small as regards even the earth, that it is possible for them ultimately to fall into the sun, as is supposed will be the case of the 1680 comet, how could all the planets and their satellites, 16 in number, have been knocked off the sun's surface by the impinging of a comet on the sun? But it is impossible that all the varieties that the earth's surface presents, setting aside the water, could have formed part of the sun, which is itself a body in a state of combustion; and, therefore, all water detached from it must be lava, not a cultivatable soil, or sand, or rock. Newton, it seems, thought that portions of the tails of comets, falling into our atmosphere, might cause with us epidemic scourges; but the principle upon which the tails are so formed I think itself denies it. What would be the appearance of a comet if stationary? Certainly globular like the sun, but surrounded more or less with nebulosity more or less dense. It is, then, its immense velocity that causes powerful resistance to its nebulosity or atmosphere by which the former is lengthened out, and kept from falling. As an analogy, even a cannon ball, with a cord or chain attached to it, fired from the cannon, would at its very inferior rate of progress drag the chain or tail in a right line with its route until the propelling force began to fail; but we know there is no failing of impetus with celestial bodies. I might allude to many other advanced theories, such as phases of comets, mountains and their deposits, effects of tides and removal of forests, or changes of the earth's surface, and on the probable causes of epidemic diseases—but I have already gone beyond the limits of a single article.

I am, Sir,
Your obedient servant,
G. L. S.

Enfield, Nov. 9, 1832.

EDUCATION OF THE WORKING CLASSES.

Sir,—The pages of your truly valuable and instructive Magazine are always open to the opinions of your readers, however humble their station in society may be, or however erroneous their opinions.* The poor, and perhaps comfortless, labourer, can offer his opinion and feed his little vanity and thirst for knowledge, in a correspondence with your philanthropic work, without the fear of abuse, or of those caustic remarks which are sure to await his humble efforts when addressed to many of the periodicals of the present day. I will venture to assert that this system of narrow-mindedness does more harm to the thinking labourer, tends more to destroy the praiseworthy resolution adopted of endeavouring to enlighten the mind, than the harsh critics who pursue it can possibly imagine. I have in my own humble circle of acquaintance seen many instances of this kind. I have seen young and industrious mechanics, who never received even the advantages of a parish-school education, but who taught themselves, by sheer industry and application in their leisure hours, the little knowledge they possessed. I have seen many such persons prevented from following their former virtuous resolution of cultivating the mind, from the severe and harsh notice taken, perhaps, of their first essay. No one who has received the advantages of education, can for a moment appreciate the innate delight experienced by a self-taught, when he flatters himself he is capable of putting anything to paper sufficiently correct and sensible for publication. This eagerness to see his paper in print prevents him from perusing it, to see whether he can improve upon it by reflection: no, the thing is written, his vanity is raised, and his mind absorbed almost from every other consideration, until the next appearance of the work to which he sent his essay. When obtained,

* I do not mean that you allow erroneous opinions to be registered in your valuable work without correction; but your correction is given in a manner so well adapted to impart knowledge, that the person convicted can have no other feeling than that of obligation.

he eagerly dives into it, for what he perhaps considers his clever production: if he finds it has been inserted, his joy knows no bounds: without waiting to read his own production, or the remarks which may be made upon it, he rushes to some of his companions who are equally eager in the pursuit of knowledge with himself,—points to the insertion of his paper with almost breathless delight, and views its perusal by his companions with sensations which cannot be described, or in the remotest degree imagined by any but those who have been placed in a similar situation. He, in fact, considers himself a superior being to what he has ever been before; almost fancies that he must have grown taller; returns to his humble labour happy, and with a firm resolution to continue his studies and endeavour to improve upon his former effort. Such, Mr. Editor, are some of the delightful sensations produced by a "little learning," which has been inaptly termed a dangerous thing. It is a "little learning" which keeps the labourer at home after the fatigues of the day, in the perusal of the many amusing and instructing publications which are now happily issued at a price within his reach. It is a "little learning" which teaches the humble labourer to respect and not to envy his richer neighbour. It is a "little learning" which renders the greatest consolation to the poor man, when upon occasions he laments his poverty, to reflect that it is but for life. Let those who exclaim upon the danger of bestowing a "little learning" to their humble fellow-creatures examine the returns made of persons in the numerous prisons of their country, and they will find that, on an average, nineteen out of twenty of those unfortunate malefactors can neither read or write. That education would prove the greatest prevention to crime, there can be no doubt; and if the wealthy and idle portions of society would bestow a tithe part of the time and trouble they take in the tuition of their horses and dogs on the instruction of their humble dependants, the moral state of the labouring classes of England would rise in a ratio which would be astonishing.

I was induced, Sir, to trouble you with these humble reflections from the perusal of Mr. Downing's paper in a recent number, having myself a large family, and the male portion of them having received their education in parochial schools, which enabled them to enter into situations of life far better than their father could do at their age for the want of such instruction.

That the system of education adopted at paro hial schools is capable of improvement may be very true, but that they are, as now conducted, a great blessing to the rising poor, cannot, I think, be questioned. They, in fact, impart the full extent of education for which they were originally designed. No reasonable person would expect that sort of education to be obtained at a charity school which would enable the scholar to translate the conclusion of Mr. Downing's paper.

Your obedient humble servant,

J. S.

Shoemaker (or rather Mender).

Mint-street, Southwark, Dec. 3, 1832.

HALL'S IMPROVEMENTS IN STEAM-ENGINES.

Sir,—It is quite clear that Mr. T. V. Robson does not at all understand the nature of any one of Mr. Hall's improvements in steam-engines, although he says he has read your article upon them "again and again." To save him the trouble of coming one hundred and twenty or thirty miles to see the whole in successful operation, I will reply to his "few remarks," although the most proper mode of treating them would have been to advise him to read the article in question "again and again," till he makes himself master of it. I shall adopt the order of his remarks in replying to them.

First, then, with respect to *the piston*. I beg to say that I have furnished Mr. Hall with several, and I find no complexity at all in the making of them. I can vouch for their action (which is the main point) being beautifully simple and efficacious. Without noticing how far "once or twice a-year" is sufficient for repacking p stons, especially large ones, with hempen or cotton packing, I will ask Mr. Robson what he means by saying that "the surface against which the packing rubs, is lengthened six inches for every revolution made by the fly wheel?" If he means that the packing is to be six times as deep as the packing of a common piston, he must have read "again and again" to very little purpose, not to see that the depth of the packing of Mr. Hall's piston may be greater or less at pleasure, quite as much so as that of a common piston.

Secondly, as to the improved slide valve. Mr. Robson talks of a steel *fan* plate. Is this word a clerical error and printer's fault, Mr. Editor? Perhaps it should be *face* plates; but as the word is used twice, pray let me beg of you to

refer to Mr. Robson's original manuscript, to see whether he calls them *fan* plates or *face* plates.* It seems to him a great fault that the adjusting screws cannot be got at during the working of the engine. One would suppose they required adjusting once an hour, instead of once a month, or perhaps not so often. The fact is, the valve works beautifully, and therefore we need none of Mr. Robson's theory against many months of real practice.

Thirdly, with respect to the lubrication. Mr. R. asks the following question: "But is Mr. Hall quite sure that oil would not become stiff by the repeated action of heat, and thereby be rendered unfit to be returned by a pump?" To this I can safely reply, yes—Mr. Hall is *quite sure;* I know that he has tried it too long, to be at all at a loss upon that subject. The fact is, that the boiling point of oil is about 600° Fahr., and Mr. Hall has found that a moist heat of 212°, or considerably higher, does not in any length of time make the oil become stiff, when it comes in contact only with distilled water; but if any kind of dirt or impurity be contained in the water, then the oil will combine with such extraneous matters, and Mr. Robson's suspicion that it will become stiff will be correct.

Fourthly, the improved method of condensation, which Mr. Robson sneers at, I consider most beautiful in principle. I say beautiful, because I have never met with any scientific man, who fully understood it, that did not so characterise it. Mr. R. gravely asks, "What can Mr. H. mean?" "Does he not know what condensed steam is, that he talks of passing steam in that state through his improved condensing apparatus, by way of keeping it in contact with the metallic surfaces nearly 1800 times longer than if it were to pervade them in its uncondensed state?" He adds, that "L is a longitudinal, and M a transverse section of a system of metallic surfaces, which Mr. H. calls a refrigerator, in the form of pipes; but as, from his particular mode of keeping them full of water, instead of steam, they can form no part of a condensing apparatus, it is impossible to discover what earthly use they can be of, unless he may have found that a reduction in the temperature of the water of condensation is essential to a saving of fuel." Now as Mr Robson cannot possibly make out this enigma, but gives it up, I will try whether it be possible (of which, indeed, I almost despair,) to make him understand it. If, then, from Mr. Hall's refrigerator you take away the caps affixed on each end of the pipes, it is evident that, as there is no injection water, the steam will pass from the working or steam cylinder into the pipes of the refrigerator, and by far the greater part will pass to the air pump in the form of steam, or water in its *uncondensed* state. This is owing to the rapidity with which the steam passes through the pipes, and consequently the short time that it remains in contact with the insides thereof; which time is not sufficient to condense more than a very small quantity, although the pipes are enveloped in cold water. But mark this: if you put a cap on each end of every pipe, as explained in Mr. Hall's description, and fill the pipes in the first instance with cold water, these caps will always continue to keep the pipes so filled; therefore, as the working of the air pump produces a vacuum at the ends of the pipes to which such pump is attached, the steam will be drawn from the working cylinder, through the small holes in the upper sides of the caps affixed on the ends of the pipes which open into the chamber adjoining such working cylinder; and when the steam enters the pipes, and comes in contact with the water in the inside thereof, it is instantaneously reduced into its *condensed state*, or (to convince Mr. R. that we know what condensed steam is) into water. This water, resulting from the condensation of the steam, is of course in the first instance hot, but during its passage through the pipes to the air pump, its temperature is reduced to within 8° or 10° of the external cold water. Now as 1800 volumes of steam, when condensed, are reduced to about one volume of water, it follows that the steam in its condensed state (*i. e.* water), is 1800 times longer in passing through the pipes, and of course in contact with them, than it would be if passed through in the uncondensed state. Let me quote Mr. Hall's own words upon this important and interesting point, the more especially as they are somewhat different from those contained in the Mechanics' Mag. for Nov. 10, 1832, pages 87 and 88, and rather more ex-

* The error was the printer's, the word in the original is *face*.—Ed. M. M.

planatory. "My improved method of condensation consists in avoiding the usual injection of cold water into the condenser. This is effected by a particular mode of using metallic surfaces, whether in the form of vessels, channels, passages, or pipes: their external surfaces being in contact with cold water, it consists in keeping them full of the water resulting from the condensation of the steam, which becomes the internal condensing water. All attempts to attain the desideratum of condensing without injection water have hitherto proved abortive, owing to the rapidity with which steam passes through pipes or other apparatus, and its consequently not being in contact with metallic surfaces sufficiently long for condensation to be effected; but by my method of causing the steam to pass through the pipes or other apparatus, in its condensed instead of its uncondensed state, it is nearly eighteen hundred times longer in its passage, and in contact with metallic surfaces, than if it were to pervade them in the uncondensed state. Thus, if a given quantity of steam pass through a given length of pipe in one minute in the uncondensed state, the same quantity of steam will be thirty hours in traversing such length of pipe in its condensed state; and although one minute be much less than a sufficient length of time for transmitting through the metallic surfaces of the pipe, the caloric or heat contained in the steam, thirty hours will do it effectually. My invention therefore does not consist in the application of metallic surfaces generally, but in the particular mode of applying them, by keeping them occupied by water instead of steam."

As Mr. Robson concludes by saying, "Not being able to find any description of the improved method of feeding boilers, I must conclude without touching on his 5th invention," I beg to refer him to the above No. of the Mechanics' Magazine, page 89, and hope, by reading it "again and again," he will find that the principle of supplying distilled water to the boilers is there fully explained.

I am, Sir, your obedient servant,

AUDAX.

Dec. 10, 1832.

Sir,—I agree with Mr. T. V. Robson, that, "in these days of quackery, extraordinary announcements are most certain to create suspicion." It becomes therefore the province of the scientific man to discriminate and distinguish between announcements of pieces of quackery and those of inventions of substantial and intrinsic merit. That an engineer, as Mr. Robson states himself to be, should have so ill acquitted himself in this respect, as he has done in the case of Mr. Hall's steam-engine improvements, is to me very surprising. To say nothing of the piston and valve, which (notwithstanding Mr. Robson's very incorrect remarks) are scientific in theory, beautiful in practice, and easy of construction, does Mr. Robson mean to tell us that the annihilation of friction, and the prevention of the escape of steam past the valve and piston, by the ample lubrication Mr. Hall has devised, at scarcely any loss of oil, is of no importance? Is not the friction of an engine estimated at about one-third of its power, and is it not manifest that the pistons, in the working cylinder and air pump (that in the latter being as well lubricated as the former), are the greatest sources of friction? Does he not see the importance of avoiding injection water, and the consequent loss of power in pumping it out of a vacuum? The reduction of the size of the air pump is surely another great advantage. So also is the supplying of the boilers with distilled water, whereby no deposit of earthy, saline, or other matter can take place to retard the generation of steam, and accelerate the destruction of the boiler. What saving of fuel is effected by each respective part of Mr. Hall's invention I cannot pretend to say, nor can I state exactly the total saving; but as I have seen the whole in extensive operation, and as I have witnessed the comparatively small quantity of fuel employed, of which from practice I can form a pretty accurate judgment, I can speak with confidence to the high importance of the aggregate advantages of the invention. There are between 30 and 40 engines at this place, and Mr. Hall offers not only to apply his improvements to them all, at his own expense, but to take them away if not approved of, and replace the engines as before. I intend, for one, to adopt them forthwith, and I have no hesitation in giving it as my decided belief that Mr. Hall's improvements will be generally and rapidly adopted throughout the United Kingdom, and supersede all other engines.

Before I conclude, allow me to remark that I really think Mr. Robson is giving an opinion upon things the principles whereof he mistakes, or rather does not understand. He says, for example, it is impossible to discover what earthly use Mr. Hall's refrigerating pipes are of, &c., whereas the particular application of these pipes forms the substratum of the whole invention.

Mr. R. acquaints us that it would take him a journey of 120 or 130 miles to witness Mr. Hall's improvements in practical operation; but I beg, for his consolation, to inform him, that there will very shortly be an engine of 25 horse power at work in London, upon Mr. Hall's principles, when Mr. Robson will have an opportunity of scrutinising it without going so long a journey. No doubt Mr. Hall has considered that, as he could not bring Mahomet to the mountain, he must take the mountain to Mahomet.

I remain, Sir, yours respectfully,

JOSEPH RIDE,
Steam-engine Manufacturer.

Vauxhall Works, Leicester,
Dec. 13, 1832.

SHALDERS' PUMP—REPLY OF MR. MALLET.

Sir,—My observations, published in your excellent Magazine, in November last, have obviously nettled Messrs. Beare and Shalders wholly out of their propriety; and as I cannot suffer myself to be aspersed by their garbled statements, without reply, I must beg your insertion of the following.

I know not whether more to admire the duplicity of Mr. Beare, or the creeping meanness with which he endeavours to escape from its punishment, under an unsupported charge of falsehood, and a mis-statement of circumstances.

It is said, "one tale is good until another is told;" and now, Sir, hear *my* account of Mr. Beare's intercourse with my father and me, and judge whether I have "shown malice unprovoked."

In July last, Mr. Beare called on us, accompanied by a case containing "gawds and trappings many"—the show-box of his trade. *He alleged that he possessed an Irish patent for Shalders' fountain pumps*, the right in which, for Dublin, &c., he proposed to sell *for the sum of* £200. We declined accepting his proposal, stating our reasons. With most annoying pertinacity, he occupied about three hours of our time, reiterating the advantages of his pump, during which time he received such repeated and decided refusals as would have sent any man, not "distinguished for palaver and botheration," about his business. He then offered his patent-right for £100, with the reservation of appointing another Dublin agent. We still resolutely, and positively refused to buy: still he plied us with arguments and entreaties; and my father, not finding him likely to decamp, left the room, and after Mr. Beare had again wasted his eloquence upon me alone, he packed up his chattels and withdrew. We considered the transaction ended, and congratulated ourselves on having got rid of such troublesome importunity.

Next morning, however, one of the first persons that met my eye was Mr. Beare again, now offering his invaluable right *for simply ten per cent.* upon whatever pumps we might manufacture under his license. My father was called; Mr. Beare received again a final refusal, and my father withdrew. Still he was not satisfied, and fairly dragged me down to Mr. Wyons, 18, Lower Ormond Quay, to see his collection of models, according to his account *at that time* laying there a dead letter; and never did I see more ingenious jugglery exercised than that with which he endeavoured to get his trumpery off his hands; while, instead of its being "quite agreeable to us that he should transfer his property into our hands," I distinctly told him, that *had* we bought his patent we should have made models for ourselves. I left him, with an intimation on his part that he would call yet again.

Reflecting, at leisure, on Mr. Beare's singular coming down in the market, it occurred to us to look for the record of Mr. Beare's patent for Ireland, and on doing so, we found that no such thing existed; consequently, that (without any "inuendo") *Mr. Beare had done his best to sell that which he not only did not himself possess, but which was not to be found "in rerum naturæ."* Such is the statement at length, of facts, the allusion to which has been so bitter a draft to Mr. Beare, and which, in his reply, he has partly slurred over, partly misrepresented.

The real marrow of all lies in the fact of his having had no patent for Ireland at the time of his interviews with us,

which his own words prove; for he says, "*On my return to London*, I valued on Mr. Alderman Hodges, at seven days' sight, in favour of my patent agents," &c. On the same day that we consulted the patent records, we got a note from Mr. Beare, saying he had perfected an arrangement with Alderman Hodges, and we immediately called on, and informed that gentleman how we had found matters. I have no means of knowing what representations Mr. Beare made to Alderman Hodges, but I know the latter appeared to receive our communication as a perfect novelty, and alarming piece of intelligence, and said he would at once institute inquiry into the circumstances. What have been Mr. Beare's subsequent transactions I know not, nor do they concern the present question, although forming a large part of Mr. Beare's reply. This much, however, I may remark, that on reference to the Rolls Office here, I find that Mr. Beare's patent for Ireland (a valuable one truly!) was not enrolled before the 30th of last October, instead of immediately subsequent to his return to London, as stated by him.

And here I conclude *my* reply to Mr. Beare's miserable display of deceit and chicanery, masked by falsehood and irrelevant detail. That the main point I have stated is true, viz.:—*That Mr. Beare had no patent when he attempted to sell it, he has himself shown, and the patent records verify it.* That the other facts are true, I am prepared to prove in a court of justice, were it necessary.

As to Mr. Beare's threat of action at law, I pretend not to understand the law of libel; but, *for an obvious reason*, I feel no alarm whatever on the subject.

Mr. Beare, too, can quote scripture. So it is said could the great master deceiver, to suit his own purpose. I might retort the same, but I should hesitate to apply the sacred text to so foul a purpose.

Mr. Beare's long catalogue of patents, and predictions of what wonders he *will* do, in due process of time, are no proofs of either originality or utility in his pumps. Of its originality let Belidor speak. I leave the question of utility for the present.

I have received a private letter too from Mr. Shalders, informing me that he would "*serve me up*," in which polished phrase we readily recognise the native vulgarity of the hereditary tanner. I, however, disdain reply to the unintelligible bombast he has excreted, as below contempt. "No scavenger is soiled with mud." Messrs. Beare and Shalders' style justifies that I have adopted.

Mr. Beare too, has ventured a covert slur upon my father's reputation. It is unlikely that such an adventurer should be able duly to appreciate the respectability that attaches to a man, who, for between thirty and forty years, has carried on business of a variety, and to an extent, that alike defies his malice or his imitation. And now, Sir, having truly placed these facts before the public, I have done; nor shall I again occupy your useful pages with such discussion, although Mr Shalders, in the true spirit of charlatanery, has informed me he would be delighted it should continue, to act as an advertisement to his pumps.

I am, Sir, your obedient servant,

ROB. MALLET.

94, Capel-street, Dublin,
Dec. 12, 1832.

THE "PUZZLER EXTRAORDINARY"—ILLUSTRATIVE EXPERIMENTS.

Sir,—Mr. Baddeley has given in your last Number a very clear solution of the "Puzzler Extraordinary" of the *Morning Herald*; and although to most of your readers it may appear commonplace to dwell any further on so well known a law of motion, there may be some to whom this law is not so familiar, and to whom the additional demonstrations of it I am about to give may prove acceptable.

In 1810 I assisted at the following experiments made at Naples by some artillery officers and men of science. A cannon of small caliber was fixed vertically on a frame with four wheels, to which two swift horses were attached.* The cannon being loaded with a ball, the horses were put to their speed, during which, at a given place, the piece was fired by a string attached to a lock, and pulled by the person who rode postilion (myself). I do not well remember the time occupied by the ball in its rise and fall. I think it was about eight seconds, which, under the circumstances, would give an elevation of about 1,000 yards, but it always fell close to the carriage, while going with the same velocity as at

* The place chosen for these experiments was a plain above a mile square, artificially levelled for military exercises.

the firing of the gun." There were two objections to this mode of experiment; one the difficulty of ascertaining the fall of the ball, the other, the danger of its falling on the horses or the rider. The first objection I obviated by substituting for the ball a piece of gun barrel, rammed full of port-fire composition, which kept burning long after its fall. The second I removed by using a cross-bow instead of a cannon, and shooting up short round-headed arrows, instead of balls. It is obvious that, could the experiment be performed with mathematical precision, the projectile sent up would fall upon the very gun or spring from whence it came, provided the velocity of translation of the latter (however great) be uniform and straight from the commencement to the termination of the flight of the former. A level rail-road and a locomotive carriage would furnish the best method of practising this experiment, and the parties on the carriage might easily be protected *sub tegmene ferri* from the falling projectiles.

Suppose a ship, sailing at the rate of five yards in a second, should fire an accurately directed shot at a fixed object which it is passing at the distance of 2,000 yards, and supposing that the shot takes seven seconds to traverse the 2,000 yards, it will consequently strike thirty-five yards wide of the object, which was in a direct line with the cannon's mouth at the instant of its being fired.

But we need not look for ships or cannons to solve the "Puzzler Extraordinary" of the *Morning Herald*. A ball or an orange thrown up while galloping on horseback will return to the hand, just as though the thrower were standing still. This I remember to have excited my attention when a little boy at exhibitions of horsemanship, at which I have seen the performers keep up several oranges, while galloping round the arena.

I have the honour to be, Sir,

Your obedient servant,

FRANCIS MACERONE.

P.S.—I should feel gratified at any of your correspondents being so good as to demonstrate the nature of the curve described by the projectiles in the first mentioned experiment. I take it to be an hyperbola. In the case of the ship is the curve (the half of the former) of similar elements?

COLD-DRAWN CASTOR OIL.

Sir,—Mr. Owen Smith, in his reply to "Castor," after explaining the mode of obtaining oil from the seeds of the *Palma Christi* by coction, observes, "the chemists may have a different way of managing it, but I cannot see any advantage in their 'cold-drawn' oil, over that obtained in the above simple way." Now it is notorious, that "cold-drawn" castor oil does possess many advantages over that obtained by coction. It is not so disagreeable either to the smell or taste, so dark coloured, or so liable to become rancid. The mode of obtaining it is, too, quite as simple as that described by Mr. Smith. The seeds are bruised, and then submitted to the action of a hand-press.*

I have the honour to remain, &c.

G. E. EACHUS.

A PROJECT.

Sir,—Will you allow me a small space in your useful miscellany to announce to the mechanical world a discovery I made upwards of ten years back, and which I now regret having so long kept to myself; but it has so much prejudice to contend with, that I had determined not to attempt to bring it forward until I could produce ocular demonstration of the fact. However, as constant employment in a totally different line of business will in all probability prevent my doing so for many years to come, I have resolved upon explaining the nature of it, and soliciting the advice of your readers on the subject. The discovery consists of a simple method of raising a weight, by the descent of an equal weight, to a height equal to the descent, which I believe has never yet been accomplished. But if that were the whole merit of the discovery it would be of little consequence and less utility. The case is, however otherwise, there being a considerable disposable power over and above what is required to bring up the weight. I am well aware, Sir, that nothing short of ocular demonstration will convince you and many of your scientific readers of the possibility of my statement being correct; but if any of your numerous correspondents will point out a practicable method whereby I can procure a moderate remuneration (bearing in mind that it is not in my power to take out a patent), I will on-

* Vide Long's Jamaica.

gage to convince the most sceptical of the truth of what I assert.

Yours, &c.

A REVOLUTIONIST.

Nov. 16, 1832.

ANOTHER.

Sir,—The writer of these lines has invented a calculator, which is adaptable to each of the four first rules in arithmetic, and will, consequently, give "the answer" to any question in the common "Tutor's Assistant." It will, also, throw out the proper types, set them, and proceed through all the remaining work of the printing-press, necessary for the composition of ready-reckoners, logarithmic tables, &c. It requires scarcely any mental or corporeal exertion to use it (when the press is unattached), except the simple pressure of the finger, requisite in ordinary piano-playing. Very few accountants, if any, can equal its dispatch, even under the hands of a mere boy skilled only in numeration, and none certainly its infallibility. Were the inventor skilled in the mathematics, he has no doubt but that, with an appendage he has separately contrived, he might adapt his calculator to the solution, mechanically, of most geometrical problems.

I am, Sir, with due respect,
Your humble servant,

J. J.

Nov. 17, 1832.

P. S.—Should any one be desirous to join the inventor (who is but a young clerk in an engineer's office), in procuring a patent, he may obtain further information by addressing him (post paid). For address, inquire of the Editor.

KYAN'S REMEDY FOR THE DRY ROT.

Sir,—In your instructive and valuable Magazine of the 15th instant, I observe you mention on the subject of "Dry Rot," that you are informed by "Perthensis," that I affect to make a secret of my patent method of preserving timber. I beg to state that, from the period of the publication of my specification, which is open to all who feel desirous of information (my foreign patents being secured), I have not attempted a futile and injurious concealment of my principle of application, which has met the sanction and approbation of many of the first chemists of the day, to whom it has been submitted for investigation and opinion as to chemical action, in reference to its efficacy against a malady the ravages of which are so universally admitted to exist to an appalling extent.

I trust "Perthensis," if he favours me with a personal application, will find in my conduct a removal of the unjustifiable impression he at present erroneously entertains.

I am, Sir,
Your very obedient servant,
JOHN HOWARD KYAN.

Depot of Tanks, Grosvenor Basin,
December 10, 1832.

[We have prepared an article on the subject of Mr. Kyan's remedy, but must, for want of room, defer its insertion till next week.—ED. M. M.]

NEW PUBLICATIONS CONNECTED WITH THE ARTS AND SCIENCES.

Goldsmith's Statistics of France.

The book before us is not exactly of that nature its title will lead most readers to expect. Instead of being filled entirely with huge columns of figures, relieved only by the driest of all possible reading—statistical details—it is, in fact and in truth, a rambling sketch of the condition of France at different times within the last half century, interspersed with tirades against the Government of Louis-Philippe, execrations of the name of Napoleon, warm encomiums of the Bourbon dynasty, personal anecdotes of the author himself or of anybody else he may happen to think of, and never-ending praises of the Count de Villèle, once Prime Minister of France, and thrice-happy in being the patron of Mr. Lewis Goldsmith (otherwise, it may be surmised, Mr. Levi Goldsmid). Amidst these important matters are interwoven, however, many valuable tables, derived, we are assured, from authentic official sources, relating to the population, administration, taxation, agriculture, manufactures, commerce, &c., of our nearest (and, at present, *dearest*) neighbours—so that the work is not altogether destitute of some valid claims to its title.*

Mr. Goldsmith, it appears, had the honour, when the star of Napoleon was at its zenith, to be selected by his Imperial Majesty himself as the editor of an English newspaper—the *Argus*—which, in his wisdom, the "Cæsar of the age" had determined to bring out at Paris, for the purpose of running down, by incessant slander, the monarch and the nation who seemed invulnerable to more ponderous assaults: but printing-types made no

* Statistics of France. By Lewis Goldsmith. London: Hatchard and Son. 1832, 8vo. pp. 370.

more impression than cannon-balls, and Mr. Goldsmith (we are informed on the best possible authority—his own) was dismissed in favour of a less scrupulous writer, and, moreover, within an ace of being kicked out of France into the very country he had been slandering !—What has been the nature of his occupations since does not very clearly appear, but in his Preface he gives the world to understand that he is an intimate friend of Messrs. Villéle, Martignàc, Polignac, &c.,—the successive Prime Ministers of France since he undertook the present work—and that, in fact, he originally undertook it at the special request of the first of these statesmen, by whose influence he has had free access to all the official documents he thought it necessary to consult. It is needless to add, since every page both in the preface and the body of the work bears witness to the fact, that Mr. Goldsmith, Buonapartist though he may have been, is *now* a backbone, thick-and-thin partisan of the cashiered dynasty of Charles the Tenth. It is only to be hoped that his predilections this way may not have led him to torture even *figures* to suit his views; his eternal attacks on the present Government can only be endured on the supposition that the tables with which they are inlaid, after the manner of Mosaic, have no bias either one way or the other—that they are perfectly and entirely *correct*.

The commencement of the work is chiefly occupied with particulars of the economy of the French Ministry and Parliament, not a little disfigured by the prevailing defect of the whole book. As a specimen, however, of the style and manner in which its information is conveyed, we prefer quoting from the division relating to Trade and Manufactures, as subjects more in place in a Mechanics' Magazine. The following enumeration of the principal branches of French manufactures, and tabular view (which we have somewhat abridged) of the capital employed, and the returns made, will give a favourable notion on these points:—

"The principal manufactures of France may be dated from the reign of Louis XIV. whose Minister, the celebrated Colbert, invited foreign artists and artisans of every kind and of distinguished merit into the kingdom, and encouraged them by premiums to fix their establishments in France. But towards the end of his reign that monarch, by his revocation of the edict of Nantes, and his persecution of the Protestants, in a great measure destroyed the advantages arising from the foreign establishments, by forcing thousands of artisans to seek refuge in England and the Low Countries, into which they introduced those branches of industry, especially silk. Thus France lost the services of some of her most ingenious mechanics, through the folly of an infatuated monarch.

"To give an idea of the manufactories of France, it is sufficient to cite the draperies of Louviers, Sedan, Elbeuf, Castres; the cambrics of Valenciennes and Cambray; the pier-glasses of St. Gobain, whose dimensions are occasionally 10 feet in height, by 4 and 5 feet broad; the cotton-manufactories of St. Quentin, Rouen, &c. &c.; the linens of Brittany, Dauphiny, and the northern provinces; the laces of Lille, Alençon, Valenciennes, and Puy; the silks of Lyons, Avignon, Nîmes, and Tours; the tapestries of the Gobelins, at Paris; the carpets of La Savonnerie and Aubusson, which, in beauty of design and brilliancy of colours, rival those of the east; the porcelain of Sevres; her manufactories of clocks and watches; jewellery, crystal, mock diamonds, bronzes, fire-arms, &c. To these might be added an immense number of manufactories which were wholly unknown in France half a century ago, such as files, needles, wool-cards, &c.

"We have learned from official sources that the capital employed in manufactures amounts to 1,820,105,409 francs, which is applied as follows:—

	Fr.
In indigenous materials -	416,000,000
In materials imported - -	186,000,000
In wages - - - - - -	844,000,000
In general expenses, as wear and tear of machinery and tools, repairs, fuel, lights, interest of money invested as fixed capital, which being deducted from the gross amount, leaves 182,105,409 fr. for the profit of the manufacturers	192,000,000

"The annual produce of the principal branches of industry, in 1828, has been calculated in round numbers at 820,000,000 francs."

The following details, relating chiefly to the watch-trade, and the succeeding table of books printed—which, we suppose, from the high authority given, may be relied on with perfect confidence—are also highly interesting:—

"With respect to the precious metals, we find that the manufactures of articles in

gold and silver had increased from 1818 to 1826, from 20 millions to 40 millions. In the former year, the quantity employed in table-services, &c. and jewellery, was as follows:—

Gold	- - -	16,170 hectogrammes
Silver	- - -	381,134
In 1825, Gold		41,078
Silver		696,075

"It is estimated that 150,000 watches are annually made in France, and about 200,000 are finished only, the movements of which are made in Switzerland, chiefly of gold (silver being out of fashion), and 850,000 clocks, in bronze, gilt, or alabaster cases.

"Few families make use of any but silver spoons and forks at their tables, nor are any other seen at coffee-houses and restaurateurs. This increase in the employment of gold and silver will not appear out of proportion with the increase of gold and silversmiths during the same period, which is from 8 to 11,000.

"The Duke Decazes, during his administration, introduced the annual exhibition at Paris of objects of industry and manufactures. All parties agree that that highly-talented statesman did a great deal to promote the industry and manufactures of France.

"In the same period, the number of public vehicles registered by Government had increased in number from 6,670 to 14,255, which is more than double in 7 years. The stamp-duties, which show in great measure the progress of commercial transactions, have increased, from 1816 to 1828, from 25,000,000 to 28,000,000.

"The branches of industry connected with printing and bookselling have not less increased than the manufactures before alluded to, as will be seen by the following official statement of the late Count Daru, which indicates the number of sheets printed in France at four different periods, in various departments of literature:—

	1812.	1814.	1820.	1826.
Theology - - -	13,815,861	4,974,788	7,867,609	23,268,420
Legislation - - -	7,833,205	1,371,568	6,326,652	18,605,495
Sciences - - -	8,175,114	2,546,270	5,327,174	12,160,381
Philosophy - - -	1,268,729	753,185	1,185,429	3,082,191
Domestic and Political Economy - - - -	1,840,993	1,634,485	1,744,246	2,097,390
Military Affairs - -	662,630	444,510	1,026,027	1,445,982
Fine Arts - - -	1,218,496	773,099	1,202,599	1,999,560
Belles Lettres - - -	15,755,904	13,352,920	20,486,803	27,704,971
Histories, Voyages, &c. -	12,934,881	16,226,566	33,149,157	46,545,727
Miscellaneous Subjects, Almanacs, &c. - -	9,079,629	3,600,648	2,121,261	7,699,977
	72,080,642	45,678,039	80,386,957	144,560,894

"The above comparison of the number of sheets published in 1812 with those in 1826, is sufficient to show the progress France had made in literature and science, since her passage from a Military to a Constitutional Government, as it will be seen that in 1826, when restricted within her ancient limits, she published double the number of works than when her empire was the most extensive. Newspapers and magazines are not included in the above statement."—P. 152.

The Journals occupy a separate article, which is certainly not the least valuable in the volume; the titles of all those published in Paris are given—daily, weekly, monthly, and quarterly—but the catalogue is, of course, too long for our pages. The provincial newspapers are also noticed, with the political bias of each; so that on this score, at least, Mr. Goldsmith's information is extremely ample.

On the whole, the "Statistics of France" will not be without value to the political economist, who will be able to pick out a good many grains of wheat from among the intolerable load of chaff; nay, much of the chaff itself is digestible. The anecdotes dragged in are often amusing, especially those relating to Napoleon and Talleyrand; and even the long eulogiums on the happy reign of the exiled Bourbons are not always without point, or destitute of interest—but, then, they are *apropos* of nothing. A palate made up for solid roast-beef cannot relish

a mere fricassee. The book purports to be printed and published in London, but the form of the types betray the fact, that it is to the Parisian press we owe this addition to our literature: while the numerous Gallicisms and inaccuracies render unnecessary Mr. Goldsmith's declaration that he has long resided out of his native country.

MISCELLANEOUS.

Captain Ross.—It is with unfeigned pleasure that we announce the safety of Captain Ross, and a great part of his gallant fellow-voyagers to the Arctic Regions. This gratifying intelligence has just reached Lloyds.—*Hampshire Advertiser.*

Potato Flour.—A novel-manufactured article has lately been introduced into the London market, from the north of Scotland, and is sold, we are informed, as fast as it arrives. We allude to "Potato Flour." The first individual, we believe, who attempted successfully to manufacture flour from potatoes was J. Whately, Esq., of Cork, but we are not aware of any establishment existing in Ireland at present for the preparation of this article. It is peculiarly applicable to making pastry: in fact, a confectioner has assured us, that by using two-thirds of potato flour, and one-third of wheaten flour, the article made therefrom is of a decidedly superior quality. The price at which it now sells is from 48*s.* to 50*s.* per sack.—*Com. Reporter, Dec.* 15.

Shower of Fire.—A singular phenomenon presented itself lately in some parts of France, particularly in the department of Orne, in the neighbourhood of Argentan. Several times, and during two whole hours, the atmosphere, which was calm, became filled with an innumerable quantity of vivid sparks, forming a sort of shower of fire. The appearance was most striking between four and five o'clock in the morning. The same phenomenon was witnessed about Caen, where, however, it excited less apprehension than at Argentan, in which place the inhabitants were under the greatest terror. It is said that in some places the sparks were seen to alight upon the ground; but no traces of them have anywhere been found, and it is probable that the phenomenon really took place in the upper regions, the appearance of having descended being most likely an optical illusion.

New Zealand Flax.—Dr. Hooker, of Glasgow, has just published an account of the Phormium Tenax, or New Zealand Flax, with a figure of the plant. It seems hardy, for it has withstood the winter of Inverness-shire in the open border, and has lately flowered near Birmingham. But what we deem most important is, that the trade in this flax with the New Zealanders has greatly increased of late years. According to the statistical returns of New South Wales for 1828, only 60 tons, valued at £2,600, were exported from Sydney to Britain during that year; while, during 1830 (according to returns taken from the Custom-house books), the quantities stated as the imports into Sydney for the English market were 841 tons, and in 1831 no fewer than 1,062 tons. Its present price in London may be stated at from £15 to £25 per ton, its quality and price varying. The flax is prepared by the natives, and in strength of fibre, and also in whiteness, far exceeds any analogous material; so that for cordage and canvass it is invaluable. Mr. Busby, civil engineer at Sydney, and a most competent judge, recommends this trade to the fostering care of Government, as being calculated to open a considerable demand for British manufactures, and to yield in return an article of raw produce "not only valuable to England as a manufacturing country, but indispensable to her greatness as a maritime power; and (he adds, in a spirit with which many of our readers will sympathise,) apart from all motives of interest, it is deserving of attention, from the opportunities which it affords of civilising and converting to Christianity one of the most interesting races of people which British enterprise has yet discovered in any quarter of the globe."—*Scotsman.*

Preservation of Ships from Worms.—The French marine have made a discovery which is likely to have considerable effect in reducing the expense of constructing vessels. Mix pitch and tar with essence of tobacco, and use this mixture to caulk the ships; by it they are preserved from worms, which the tar thus prepared poisons. This will save the expense of copper bottoms, and make a diminution of some millions annually in the expenses of the naval department.—*Times.*

Paces of the Snail.—The locomotion of animals which have no feet, is a curious subject of physiological investigation, and has in some instances well rewarded the study of naturalists. The leach, the earth-worm, serpents, &c., have each their peculiar modes of progression; but the snail, as any person may observe, moves differently from all these, gliding along without jerks or undulations in any part of its body, and each point of the surface advancing simultaneously; for, the belly being smooth, with no appendages to perform the office of feet, the whole body, consequently, moves at once. Mr. J. Main, who has written an ingenious paper on the subject, has studied the motions of the Limaxmaximus, L. ater, L. rufus, and L. agrestis; and, by placing them on glass, the muscular motion was remarked to be from the tail to the head, and, of course, the movement cannot be by impulses. Mr. Main thinks the movement is produced by the propelling force of the slime projected in a retromissive manner from all parts of the body at once.

Copper-Wood.—Near Casan, a black wood is found fossil, whose parts are united by some tenacious matter—the whole resembling charred wood. In many parts of this wood, copper occurs in crystals of a dark green colour, passing into black, and assuming the appearance of vitreous crystallizations. In the mine near Sanxson where these are found, *blende* occurs, mixed with wood, sand, and copper. The bark of the copper-wood is often distinguishable, being about four lines in thickness, and separable into two layers, the one of an azure blue, and the other of a pale verdegris green. Entire trees of this kind are frequently found.—*Voyages dans Siberie par M. l'Abbé Chappe d' Anteroche.*

INTERIM NOTICES.

Mr. Rutter—Yes.

Communications received from Vindex — Mr. Locke—Junius Redivivus—S. T. P——s—T. M. B. —Mr. Syngleman—Mr. Gorie—J. H. E.— T. V.— T. W.—Φμ.—Mr. Dennis—Mr. Sloane—Anti-Mud Protector—J. E.—Mr. Dummett—Tyro—Mechanicus.

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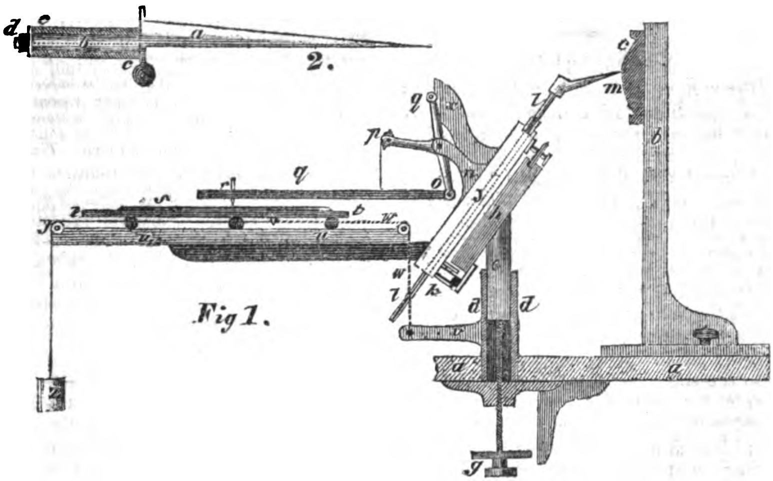
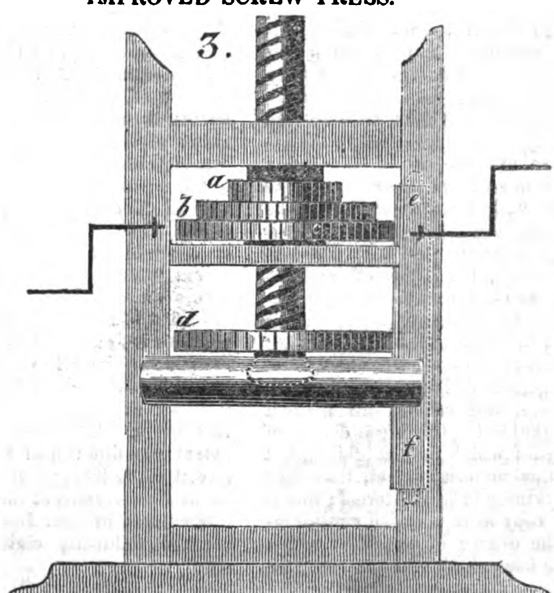
MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 490.] SATURDAY, DECEMBER 29, 1832. [Price 6d.

MEDAL ENGRAVING MACHINERY.



IMPROVED SCREW PRESS.



MEDAL ENGRAVING MACHINERY.

In the old *Manuel de Tourneur* an apparatus is described by which copper engraving may be produced from medals and other objects in relief. The medal and the copper are fixed on two sliding-plates at right angles to each other, and so connected that when the plate on which the metal is fixed is raised vertically by a screw, the slide holding the copperplate is advanced by an equal quantity in the horizontal direction. The medal is fixed on the vertical slide with its face towards the copperplate and a little above it. A bar, terminating at one end in a tracing point, and at the other in a short arm at right angles to the bar, and holding a diamond point, is placed horizontally above the copper, so that the tracing-point shall touch the medal to which the bar is perpendicular, and the diamond point shall touch the copperplate to which the arm is perpendicular. Under this arrangement, the bar being supposed to move parallel to itself, and consequently to the copper, if the tracing-point pass over a flat part of the medal, the diamond point will draw a straight line of equal length upon the copper; but if the tracing-point pass over any projecting part of the medal, the deviation from the straight line by the diamond point will be exactly equal to the elevation of the corresponding point of the medal above the rest of the surface. Thus by the transit of this tracing-point over any line upon the medal, the diamond will draw upon the copper a section of the medal through that line. A screw is attached to the apparatus, so that if the medal be raised a very small quantity by the screw, the copperplate will be advanced by the same quantity, and thus a new line of section may be drawn; and, by continuing this process, the series of sectional lines upon the copper produces the representation of the medal on a plane; the outline and the form of the figure arising from the sinuosities of the lines, and from their greater or less proximity.

Engravings produced by this method were remarkable for the high degree of apparent relief which they exhibited, but possessed this material defect, that they were always more or less distorted; that is to say, the copy always varied considerably from the degree of exactness which would have been obtained by a perpendicular projection of each point of the medal upon a plane *parallel to itself*. The position of the prominent parts was more altered than that of the less elevated; and the greater the relief of the medal the more distorted was the engraved copy. The consequence was that this mode of engraving, though well known to the curious, never came into general use. Of late, however, means have been devised of completely rectifying the distortion we speak of; and medal engraving now bids fair to become a very popular and important branch of the graphic art. Two very beautiful specimens of it have recently attracted general attention in town; one a head of Roger Bacon, prefixed to Mr. Babbage's Economy of Machinery and Manufactures—and another a head of his present Majesty, which embellishes Mr. Heath's *Keepsake* for 1833. The effect of both is extremely striking; so much so, that one can hardly believe at first that the heads are not in actual relief.

The merit of this revival of the art is claimed by Mr. John Bate, of the Poultry, but has been *re*-claimed by the Americans in favour of a countryman of their own, Mr. Asa Spencer. The first time, we believe, that Mr. Bate's name appeared before the public in connexion with medal engraving was in a notice of the evening meetings of the Royal Institution, which appeared in the *Philosophical Magazine* for April last, where it was stated that, on the 3d of February, "the beautiful machine constructed by Mr. Bate, of the Poultry, for producing engravings of medals by machinery applied to the surface of the medal itself, or to that of the cast from it, was shown and explained by Mr. Faraday." On the 9th of April following Mr. Bate took out a patent "for an improvement or improvements on machinery applicable to the imitation of medals, sculpture, and other works of art executed in relief;" a patent of very questionable validity, if it be true that the machine was two months before "shown and explained" at the Royal Institution. The specification of this patent was due 9th of October; but before it made its appearance the Committee of Publications of the Franklin Institute entered in their Journal for September the following claim of prior discovery:—

"Believing that the credit of the invention of a machine for medal ruling is due to America, we will briefly set forth our proofs, and then speak of the improvements which of late years the method has undergone.

"The proofs to be given of the existence and state of a machine are to be derived from the results produced by it.

"In 1817, by the use of a machine which had been invented in Philadelphia, Christian Gobrecht, die-sinker, produced upon copper an engraving from a medal, having upon it the head of Alexander of Russia: from this engraving impressions were taken and distributed. One of these impressions we have seen.

"In 1819 Asa Spencer (now of the firm of Draper, Underwood, and Co. bank-note engravers,) took with him to London a machine of the kind above alluded to, which was designed principally for straight and waved line ruling. This machine was used in London during the year just mentioned, and the mode of ruling waved lines, and of *copying medals*, was then exhibited and explained by Mr. Spencer to several artists; particularly to Mr. Turrell, who took, by permission, a drawing of the machine, for the purpose of having one made for his own use.

"Little, however, was done in the way of medal ruling until about three years since, when a desire to apply the method to the engraving of designs for bank-notes caused it to be revived by Mr. Spencer, who bestowed great attention upon it, and overcame the difficulties met with in the outset.

"The peculiar construction of this machine has never been made a secret, nor has it ever been patented, although prudential motives have required that it should not be minutely described, and thus be placed in the hands of those by whom its use might be perverted. In consequence of this free communication in relation to this machine, it is now made, with modifications in the details, for engravers, by some of our machinists. We have lately had the pleasure of inspecting one of beautiful workmanship, made by Messrs. Tyler, Fletcher, and Co.

"The operations performed by this machine are the ruling of parallel straight lines at any required distances apart, and either continuous or broken; ruling converging straight lines; ruling waved lines, the waves being either similar or varying by more or less imperceptible gradations; and medal ruling, or transferring to copper the fac-simile of a medal without injuring its surface, the waved lines presenting a copy of the minutest parts of the medal.

"Mr. Bate is said, in the extract which we have given, to be engaged in *perfecting* a machine for medal ruling: in his patent he claims the improvements on a machine for that purpose. It is impossible to say how far this latter claim may be borne out, since a description of the patented improvements has not yet reached us.

"That Mr. Spencer has essentially *perfected* this machine, as far as beauty of execution and fidelity of representation in the work to be done by it are concerned, we do not hesitate to say; and that the public here, and our brethren of England, may be enabled to judge for themselves, we have obtained from Mr. Spenser a specimen* of medal ruling executed with his machine, an impression from which we give.

"The engraving is made from a copper medal placed in an embossed card of the ordinary kind. The surface of the medal bears not the slightest trace of injury from the machine, and even the yielding surface of the card is not roughened by it.

"An impression taken thus from a plate gives but a faint idea of the exquisite effect produced by engravings themselves made by this machine upon a polished surface of gold or silver.

"A series of the Napoleon medals, together with a portion of the series of medals struck in commemoration of the events of the first French revolution, attest the skill of Mr. Spenser."

The specimen alluded to in the preceding extract is a medallion head of Congreve, the dramatist, and it must be confessed that it fully bears out the Committee of the Franklin Institute in all they have asserted of it. It is quite as free from distortion as either of the English specimens we have before mentioned, and differs from them only in being somewhat less highly finished. The Americans have clearly nothing to learn in the art from us; and till Mr. Bate can fairly disclaim all acquaintance with the disclosures which Mr. Spenser made when in London, (which he has not yet done, though invited to do so,) there seems, on the contrary, every reason to conclude, that it is to them we are indebted for the important improvement which has been just introduced.

The mode by which Mr. Bate corrects the distortion which resulted from the operation of the original machine, and which is, in all probability, the same

* "Various specimens of this work have been long since sent to London, and may be found in the possession of Messrs. Perkins and Heath, and of other artists."

with that followed by Mr. Spenser, consists in causing the line described on the copper to deviate an equal quantity from the straight line upon the copper as the tracer is diverted from a plane perpendicular to the plane of the medal. To explain this more clearly we shall subjoin a description of the machine in its improved state, given in the last Number of the *Register of Arts*, which, though stated by Mr. Hebert to be "from memory," appears to be, on the whole, abundantly clear. The reader will please refer to our front page for the two figures described:—

"Fig. 1.—*a a* represent a portion of the table, to which is screwed a standard *b*, that receives the medal *c*, or other subject to be copied. To this table is also fixed a brass socket *d d*, in which a bolt *e*, fitted to it with great accuracy, is made to slide up and down by the agency of a fine threaded screw *f*, provided with a micrometer head at *g*, for the purpose of adjusting the motion through equal spaces. The vertical bolt *e* is surmounted by a strong plate or guide frame *h*, fixed to it in an inclined position; on the upper edge of this frame is a groove, in which run two or more rollers, or little conical edged wheels (as that seen at *i*), fixed to the under side of the upper part of a carriage *j*: this carriage has another roller at bottom, marked *k*, which runs upon a flat plate bolted to *h*. This carriage, made of brass, has a flat steel plate *l l* passed through it, with conical edges moving against anti-friction rollers, and to the upper edge of the steel plate is fixed the tracing point *m*, as will be hereafter more particularly described. *n* is a standard fixed to the tracer carriage, bearing a three-armed piece *o p q*; the lower extremity of the arm *o* being jointed to a bar, which carries the etching point *r* over the copper or steel plate *s*, lying on its carriage *t t*, running upon a metallic stage *u u*. *v* is a metallic arm fixed to the socket *d*, and connected by a steel chain *w w* to a stud *x* in the under side of the plate carriage; to this stud is also attached a silken cord passing over a pully at *y*, suspending the weight *z*; the province of this weight is to draw the carriage plate backwards, as the tracing point passes over the projections of the medal, while the chain *w* draws the carriage forward as the tracing point passes into the cavities. In cases where the descent into cavities is perpendicular, or nearly so, to the plane of the middle, neither the common conical point, nor the tapering blade *m*, will reach the required spot; to obviate this difficulty, the patentee has inserted a very ingenious tracer of the blade form (fig. 2). *a* is the blade, having an axis *b*, with the centre of motion coincident with one straight edge of the blade, *c c c c* represent a socket, intowhich the pivot *b* of the blade fits with great accuracy, but made to turn with facility; the nut *d* keeps the tracer up to its bearing, to prevents its shaking longitudinally. It is evident that this form of tracer will admit of its being passed down the perpendicular sides of any declivity, in whatever direction the perpendicular side may be."

IMPROVED SCREW PRESS.

Sir,—I send herewith a sketch (see figs. 3 & 4, front page,) of what appears to me a more perfect form of the improvement proposed in the Mechanics' Magazine upon Hunter's screw press:—

The concentric toothed-wheels *a*, *b*, and *c*, are in one piece, and form the nut; *a* has 15 teeth, *b* 30, and *c* 50; a fourth toothed-wheel, *d*, fixed on the neck of the screw, has 51 teeth, being one tooth more than *c*. An elongated pinion, *e f* (shown out of its place in fig. 4), is sunk in a side-post of the press, and establishes a unity of motion between *c* and *d*. Thus, when *c* is set in motion by the winch, (which carries an endless screw on its axis, not shown in the figure,) *d* is compelled to move likewise; but as *c* has one tooth less than *d*, the nut will overtake the screw by one tooth on every complete revolution of the screw. The pinion *e f* may be put out of gear at pleasure. The press, therefore, has six degrees of power, those of *a*, *b*, and *c*, when the pinion is out of gear, and *d* clamped; and the new powers of the same, *a*, *b*, and *c*, when the pinion is in gear, and *d* free.

I should have stated, also, that the winch, as in the former plan, is to be continued, so as to be adjustable at pleasure to any of *a*, *b*, and *c*. One of the very highest authorities of the day has already pronounced the invention to be too complex for general use. It may, however, appear worthy of insertion, as a mechanical novelty, and perhaps furnish subject of thought to some of your practical men, who may pursue the object to more useful results.

I am, Sir,
Your obedient servant,
Φ. M.

THE PROPOSED IMPROVEMENT ON ERICSSON'S STEAM-ENGINE AND WATER-WHEEL.

Fig. 1.

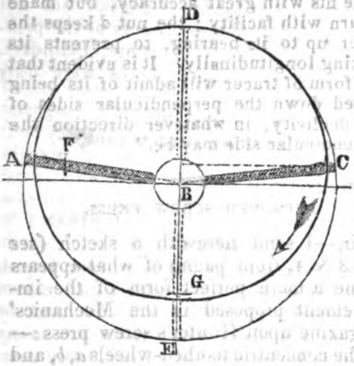
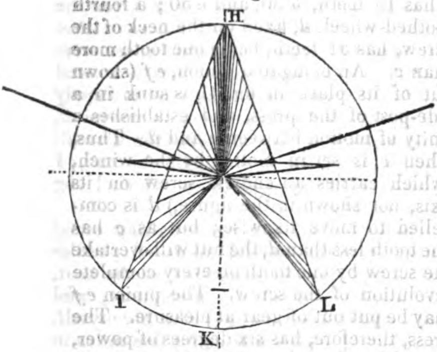


Fig. 2.



Sir,—A design for a supposed improvement of the steam engine, first noticed in the Mech. Mag. for Sept. 22, 1832, having appeared in the number for Dec. 8, accompanied by an invitation for "criticism," I beg to offer the following. But before entering into the detail of the subject, I cannot refrain from expressing some surprise that your correspondent, who thinks that the "grinding" demonstrated by Mr. Busby will be a "serious affair," should have been at the trouble to contrive an "improvement" in which the *whole force* of the engine is causing a constant grinding. It can hardly escape even a casual observer that the motion of the engine proposed is produced *solely* by the pressure of the wings or pistons against the corners of the slits of the cones; and as there must be a *constant motion* between these corners and the wings, it follows that the *whole force will be propagated by means of grinding surfaces pressing against each other.* The natural consequence of such a disadvantageous mode of producing motion will be, that the surfaces of the wings and the corners of the slits, or their packings, must inevitably be destroyed, and a great loss of power occasioned. It appears quite unaccountable that a "modification" or contrivance of such properties as these should have been thought an *improvement* by any one who has "proposed to himself to avoid grinding," and such a grinding too which has been incontestably proved not to diminish the power more than $\frac{1}{200}$ part, and which, on account of the slow motion and great dimensions of the surfaces exposed, ensures their wearing many times longer than even the least exposed of any other working part of the engine.

In order more minutely to show the inefficacy of the proposed arrangement, I must refer to the accompanying sketches. Fig. 1, which represents the end-view, shows that although the wings or pistons are *in a line* when in the vertical position, they will form *an angle*, A B C, when in the horizontal position, on account of the oblique position of the cones. This circumstance will evidently cause a great irregularity in the velocity of the wings, for whilst A B passes from A to D, the wing B C must pass the much greater distance from C to E. The unavoidable inconvenience caused by this alternately angular position will be, that the wings cannot be fixed to the centre-ball, and hence each must *propel* and *be propelled* alternately for every half revolution, and at every change a violent blow will take place; for the wing, instead of being propelled by the cone, will be brought against the opposite edge of the slit, with the full force and velocity of the steam, the instant that the opposite wing gets below the waste-steam aperture.

In examining fig. 2, it will be found that although the *power* moves in the direction H K, the *effect* must be produced in the directions H I and H L. This evidently makes the wing act to great disadvantage on the cone; besides which, it gives an additional irregularity to the power exerted. For, when in the horizontal position, and of course presenting the *least* surface to the action of the steam, the centre of pressure of the wing

will be situated considerably *inside* of the circumference of the cone (see F, in fig. 1); but when the wing is in the vertical position presenting the *greatest* surface, the force will be still further increased by the centre of pressure being then *very near the circumference* of the cone. (See G, fig. 1.)

The principle of the proposed arrangement having been thus briefly noticed, I wish to call attention to some of its practical deficiencies. In the first place, the positions of the cones are required to be *perfectly accurate;* but how is this accuracy secured? By *four* cog-wheels and *four* gudgeons! the least variation or play in *either* of which will occasion the twisting of the wings. The next point is the great leverage of the cones on their shafts, which will render a steady action almost impossible; to say nothing of the great pressure thereby caused where the shafts pass through the chamber, as well as in the pivots; and besides the increased friction in parts similar to the original engine, there are added three cog-wheels and three large bearings. With regard to the increase of power calculated by your correspondent, that point should, supposing the plan a practicable one, be considered in connexion with the space occupied, and the weight. On this head, it suffices to say, that the driving shaft is brought nearly three times as high above the base of the frame as in the original engine. How this will affect the weight of the frame-work I need not point out. As to the space, the section of the proposed engine measures 8 feet 3 inches by 5 feet 9 inches, whereas the original one is only 6 feet by 3 feet 9 inches.

Your correspondent being desirous of increasing the power of the engine, I would suggest to him to do away with the cog-wheels at once, and, instead, attach a cone at each end of the driving shaft, with their wings at right angles. The power would thereby be doubled, and an unprecedented regularity obtained, and bulky frame-work avoided.

To conclude, I wish to assure your correspondent that the idea of making two cones to work together is no novelty to the inventor of the engine which has called forth the display of your correspondent's ingenuity, and which he promises to improve by further modifications. I will add, that since a perfect rotary engine requires that the action of every part of it should be rotary, it becomes a matter of demonstration that obliquity or eccentricity should form its principles. Accordingly, the patented engine was not constructed until some twenty of the principal combinations of cones, cylinders, globes, and circular planes were duly considered.

I am, Sir,
Your obedient servant,
J. E.

London, Dec. 15, 1832.

EXPERIMENTS IN CANAL STEAM NAVIGATION

Sir,—It may be deemed very imprudent for an individual with small means to attempt propelling a canal boat by steam, especially when there are many persons in his neighbourhood, more competent to the undertaking, having more money and better conveniences for the purpose. I well knew, however, that though their means and appliances were ample, they had more lucrative and agreeable channels wherein to apply both. With this impression on my mind, and having no employment for a small steam-engine which I had by me, I commenced the experiment which I beg now to relate.

Selecting an old heavy-sailing canal boat, I tried several kinds of paddles placed in various situations of the boat, repeatedly altered the machinery, and travelled several voyages with her myself, the last of which was about five miles in three hours on the Birmingham canal, with twenty tons long weight on board her, exclusive of the machinery. With this heavy-sailing old canal boat, an engine, not built for the purpose, and machinery put together in a country place, where no such workmen or tools can be had as are to be found in large manufacturing towns,—with these disadvantages I have performed that voyage by steam alone, without the aid of any other power. By this dearly-bought experience, I am in possession of the dimensions and capacity of every article necessary—the limits of the projection of the machinery and guards, above, below, and on the sides of the vessel, so as to clear locks, bridges, slopes, and other boats and lines; with the precise strength of the engine required to propel a boat at the utmost speed which the

depth of canal will admit. I can, therefore, confidently state *that canal boats can be propelled by steam* to answer every purpose, except short voyages and frequent loading, up and down any locks, without injury to the canal banks, without injury to other craft, with the same manual labour, and with about five shillings in fuel for a hundred miles' voyage. The charge of steam navigation being injurious to the canal banks, must have originated in error, or perhaps, from prejudice before the rail-road system had been proved: for my own part, if I wanted to lessen the damage now done to the canal banks and other boats, I would propel them by steam instead of tracking by horses. In fact, any person acquainted with the business of a canal will acknowledge that a horse draws in an indirect line, while the steerer, to keep his vessel straight, puts the helm to the opposite side, which causes a heavy surge, and this is much increased in windy weather, and, with an increased speed, still more; while a steamboat glides sweetly and majestically through the water, the paddles heaving in a direct line, always a-head. With regard to speed, it must be in proportion to the shape of the boat, the quantity of lading on board, and the depth of water; and, generally speaking, the depth of canals is not such as to admit of a very great rate of speed, because, if a power sufficient were applied to a boat heavily laden, she would soon drag on the bottom. But it must be remembered, that if a horse draws a boat at the rate of seven miles an hour, that boat and horse, at the end of an hundred miles voyage, would be more than twenty miles behind one propelled by steam at the same rate, since passing the lines of other boats, and thus letting down the boat's momentum, would cause this difference.

At some cost, and much labour, I have enabled myself to state these facts, but at present I must lay my boat and engine aside, from necessity, however, not choice. If there be anything in my experience acceptable to a more competent adventurer than myself in so laudable an undertaking (for it wants only competence), so as not to leave it in the hands of monopoly, I would gladly afford every information in my power.

Your obedient servant,

R. G. M.

December, 13, 1832.

EXPERIMENTS ON THE NATURE OF HEAT.

Sir,—I propose in the present letter to describe an experiment which I hope will tend to elucidate, in an easy manner, a point which has been long disputed, namely, the real nature of heat. In a recent number of your work, you reviewed the latest publication on the subject, that of Mr. Donovan, who leaves the question undecided, whether there is such an element or not as heat in the universe. In every chemical work to which I have had access, this question is left also undetermined.

In the Treatise on Heat by the Society for the Diffusion of Useful Knowledge, it is stated, 'It cannot be determined whether the phenomena of heat is occasioned by a subtle fluid, capable of entering into bodies and of being emitted from them, or by motion, vibration, or rotation excited amongst the particles of matter. The arguments which have been adduced and the experiments which have been made are inconclusive, however varied and ingenious they may be.' In Mr. Brande's Manual, and in his Treatise on Chemistry, in the Supplement to the Encyclopædia Britannica, the same indecision prevails. Yet I have heard Mr. Brande, in delivering a course of Lectures at the London Institution, assert that heat, light, electricity, and magnetism were only modifications of the same element, and he satisfactorily shewed, by the aid of the immense galvanic battery of the Institution, the perfect and ready convertibility of the aforesaid elements.

Now, that heat, light, and electricity are modifications of the same element, and that they are parts and portions of, and, though latent and quiescent, exsist in profuse quantity in cold, solid substances, may be seen by striking a few sparks with a common flint and steel, and collecting the dust upon a sheet of paper. Viewing it with a magnifier, the dust will be found to consist of unaltered fragments of flint intermixed with the sparks, which exhibit a dark-coloured shining surface, many of them the shape of semi-spherical cups, others irregular, but all of a fused appearance. To the collected dust and sparks, placed in a glass capsule with a mixture of muriatic and nitric acids, apply heat, and a solution of the sparks will be readily effected, the fragments of flint remaining unaltered, being insoluble in chlorine. The clear solution being slowly evaporated to a glutinous consistency, and water added thereto, silex was deposited; to the clear aqueous solution prussiate of ammonia being added, a deep blue coloured precipitate subsided. The sparks then consist of iron and of silex—of silex rendered soluble in chlorine by a chemi-

cal change in its constitution. The nature of that change I will show in a future experiment. At present let us repeat the experiment of striking a few more sparks, with the flint and steel immersed in water. A few sparks, and but a few, will be visible if this experiment is made in the dark; but on examining the dust produced by the collision under water, the sparks will be found as numerous, of the same appearance, and of the same chemical constitution as those obtained in atmospheric air. Here, then, be it observed, we have, in an inappreciable space of time, in the most unfavourable situation imaginable, two most refractory substances fused and vaporised: they have been chemically decomposed and chemically recomposed, and heat and light have been elicited from them. No heat or state of fluidity, short of vapour, could allow of the free transference of the respective elementary particles, to mutually penetrate and saturate each other instantaneously.

Now, have we any conception of, or any application of heat, except electrical, that could dissever and vaporise instantaneously a small piece of iron and of flint, each being a solid undivided portion of a large mass, immersed in water? Have we any conception of any attractive force, except electrical attraction, that can instantly dissever, and in the same instant remove and transfuse, re-arrange and refix, an immense number of elementary particles of different kinds of most refractory solid matter (for sparks of great magnitude and considerable igneous duration are frequently elicited from the action of the pickaxe upon flint)? Must we not conclude that heat and light are electric—that these elements are naturally held in quiescence in quantity in flint and steel, and that the effect of percussion is probably to bring great force to bear upon a small point, and, by compressing the heat into less volume, to give it instant energy and liberty to exercise its repulsive powers?

I am Sir,

C. M.

THE "MUD PROTECTORS."—CAUTION.

Sir,—Some weeks ago I saw in your valuable Magazine, a description of a "Mud Protector" (?) from which I was induced to purchase a pair, and paid 4s. for them. Now, as you have no doubt caused a great demand for the article by giving it a place in your widely circulated work, I think you are bound in justice to insert this caution to your readers, against being gulled by would-be inventors, by stating that they are entirely useless—in fact worse, than useless. I hand you my address to authenticate this, and remain, Sir, your Constant Reader,

ANTI-MUD PROTECTOR.

PISTOL SHOOTING.

Dear Sir,—I do not know whether the following extract from Byron's Journal, will be of any service in the case of Probability *v.* American Rifle-shooting; however, I send the bare bird, and leave the disputants to feather it as they like.

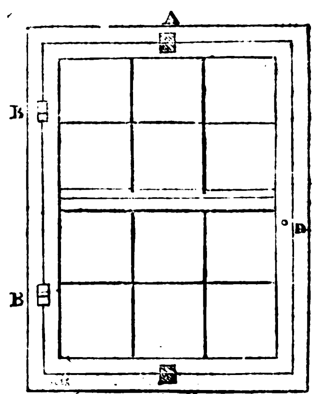
After detailing some of his pistol practice, Lord B. says it is almost as good as "when in 1809, 10, 11, 12, 13, and 14, it was my luck to *split* walking sticks, *wafers, half-crowns, shillings,* and *even the eye of a walking stick,* at twelve paces with a single bullet, and all by eye and calculation, for my hand is not steady, and apt to change with the very weather. To the prowess which I here note, Joe Manton and others can bear testimony; for the former taught and the latter has seen me do these feats."

I am, dear Sir,

Yours truly,

L.

DOUBLED-FRAMED SAFETY-WINDOW.



Sir,—I send you the plan of a window, which, if adopted, will be of manifest utility, by preventing those accidents which are continually occurring. The window is to have two frames; the outer one, D, to be a fixture—the inner one, C, containing the weight-lines, &c., to shut into it like a door, to open inside, and to be supported by two hinges, as at BB, with a support in the wall for it to rest on when open, or else to turn on two pivots in the centre, as at AA. The ease with

which windows could be thus cleaned inside of the room would give a much more brilliant appearance to our houses, and would be the saving of the lives of thousands, whilst the expense would be but trifling.

J. B. C.

Nov. 24, 1832.

GAS METERS.

Sir,—A short time ago I suggested to a most respectable manufacturer of gas meters, that if the stand of the meter were so constructed as to contain, if required, two or three quarts of hot water, it would afford a ready means of preventing the freezing of the meter water, or of thawing it, should it have become frozen. I was induced to offer this hint, because I had been told that in some towns, in very severe winters, 20 or 30 meters had been thrown out of work in one night, to the loss of the gas company, and the serious inconvenience of their customers. The gentleman above alluded to has assured me, that any such addition to the meter is wholly unnecessary, for the instances are exceedingly rare in which the water becomes frozen in meters employed for coal gas. I have reason to believe that he is mistaken.

Can any of your readers furnish me with conclusive facts relative to the questions—whether it is an uncommon occurrence for the water in *coal-gas* meters to freeze? and if, in those used for *oil gas*, the water freezes more frequently than in the former?

J. O. N. Rutter.

Lymington, Hants,
Dec. 17, 1832.

THE MAGNETIC INFLUENCE.

Sir,—Your correspondent, T. O. M., p. 47 of your present volume, may be assured that no substance known will stop the magnetic influence in the way in which he means: it seems to traverse space, whether occupied or not, with equal facility. The same effect may, however, be produced in this way. Take two bar magnets of equal size; fix them parallel to each, with opposite poles towards the same end; let them turn on pivots, so as to approach and touch at their ends when necessary; and when they are in the parallel position, let the distance between their poles be the same with that usually made between the poles of a horse-shoe magnet. This apparatus, as long as the magnets are kept parallel, will exert an external force nearly equal to a horse-shoe magnet of similar size; but the moment the poles of either end are brought into contact, all external influence at that end ceases, and is in effect cut off. I apprehend the inquirer is in search of what is commonly called perpetual motion: it is easily effected by such means as I have described, but is not worth the trouble, no more than the many other contrivances for the same end.

I am, Mr. Editor, your obedient servant,
Φ. M.

FINE IRON AND STEEL WORK.

Sir,—I beg to submit the following expedient as a remedy for the complaints I have heard from fine workers in iron and steel. Instead of the common furnace and bellows, construct a draught furnace, as if for melting brass; let a crucible of suitable size and depth fit close into the mouth of it, and charge the crucible with a mixture of pure clean sand and powdered charcoal. There will thus be constructed a bath of as high temperature as may be requisite; and it seems to me that there will also be one evil avoided, and two considerable advantages gained: for the iron or steel will not be subject to oxidation, but will, on the contrary, gain two very important acquisitions, by the absorption of carbon and of silex from the bath.

I am, Sir, your obedient servant,
Φ. M.

ATMOSPHERIC AIR.

Sir,—In proving the strength and soundness of the copper vessels which I use for my oxy-hydrogen blow-pipe, as described in your present volume, p. 172, I have observed a peculiarity in atmospheric air, that I do not remember to have seen noticed by any of the writers on its chemical or its mechanical properties.

After having forced 4 or 5 atmospheres into either of the vessels, on opening the stop-cocks, the escape of air, as might be expected, is exceedingly violent. I was somewhat surprised, however, to find that the whole of the suppressed air did not

make its escape immediately. When the air within the vessel had apparently recovered its ordinary density, on closing the stop-cocks for about 5 or 10 seconds, and then re-opening them, air again rushed out with considerable violence, and so it continued to do three or four times successively, but diminishing in its energy each time.

I have frequently repeated the experiment, and the result has been uniformly the same. I now mention it, Sir, with the hope of eliciting from some of your learned correspondents a satisfactory explanation of the cause of the phenomenon.

The commonly received opinion respecting air is, I believe, that by its elasticity it always recovers its original dimensions the instant it is relieved from mechanical restraint. But does not the circumstance I have mentioned favor the conclusion that something very analogous to a *condensation* of the two gases of which the atmosphere is chiefly composed takes place, and that they regain their primitive form and dimensions by a process comparatively slow and gradual in its operation? By the term condensation, as here employed, I do not mean a mere forcing together into a less space the particles of azote and oxygen; but it implies such a combination of those particles as, in other gases, we denominate liquefaction. May we not expect to see air liquefied?

In the case before us, I am at a loss to account for the peculiarity on any other principle than that referred to. Surely the mechanical force employed is not sufficient to drive any considerable quantity of air into the metal of which the vessels are constructed; or is it probable that the aqueous vapour held in suspension by the atmosphere can produce the effect I have described?

J. O. N. Rutter.

Lymington, Hants,
Dec. 17, 1832.

MODE OF WORKING THE COAL MINES OF NORTHUMBERLAND AND DURHAM.

(Concluded from our last, p. 189.)

3. Explosions (continued.)—The explosions are occasioned by the firing of the inflammable air, either through unavoidable accident or through the carelessness of the workmen. The inflammable air is evolved from the coal at the natural temperature of the earth. Hence it is, that coals lying deep abound more in it than coals lying near the surface, because there are openings at the surface by which it escapes; but in the deep mines it cannot have such outlet, and therefore it accumulates in all the fissures of the stone above the coal: consequently, if the mine is ever so well ventilated and cleared one day, it becomes, like a well filled with water, charged with inflammable air the day following. The fissures of the roof are in some places very extensive, and the communications distant and remote. They may be considered as natural gasometers, where the gas, not having any outlet, becomes compressed by the constant accessions made to it, to an extent that is almost incredible,—an extent, indeed, which has no limits short of the resistance offered by the quantity of rock above it, and the thickness of the surrounding stratification, whatever it may be, whether stone or coal. In the course of pursuing workings into the whole coal, the miners frequently cut across fissures of this description (technically called blowers), and in a few minutes, from a state of perfect safety, a pit will become charged with gas to the point of explosion. As long as the proportion which this inflammable gas bears to the atmospheric air does not exceed one to fourteen, all is safe. But Sir Humphrey Davy's experiments show that if there is more than one volume of inflammable air to fourteen of atmospheric, a mixture is then produced which will instantly explode on coming into contact with flame. The quantity of foul air poured out from these blowers can never of course come within the reach of calculation; but some notion of the magnitude of the danger from this source, may be formed from the fact, that in a colliery of which Mr. Buddle is the viewer, it is found necessary, in order to counteract the evolution of gas from the roof and face of the coal merely, and to keep the mine in a safe working state, to introduce no less than 18,000 cubic feet of atmospheric air per minute. Although the mixture is explosive at the proportion of one to fourteen, the miners can contrive to work and breathe in it without much inconvenience, till there is only six or eight volumes of atmospheric air for one volume of inflammable air. Of old, the only safe means of introducing a light into such workings, was by means

of what is called a steel mill. This consisted of a small wheel of steel, of six or seven inches diameter, urged by a little tooth wheel with great velocity; a flint was applied to the periphery of the steel wheel, and a stream of sparks elicited. A steel mill was very hard and expensive work; they were obliged to have two persons to relieve each other. The light, too, obtained was extremely feeble; neither was it always unattended with accidents: indeed, in a certain mixture of inflammable air—about one in eight—there was no safety in it at all, and many were the explosions which it occasioned. The miners could tell in some measure when there was danger, from the appearance of the sparks, which assumed more of the semblance of a continuous flame as the danger increased; but the advances of the enemy were often so sudden and rapid as to set all precaution at defiance. The steel mill has now been completely superseded by the safety lamp, which has introduced quite a new era in coal mining, as many collieries are now in existence, and old collieries have been reopened, producing the best coal, which must have lain dormant but for its introduction. Almost all the collieries below bridge, on the Tyne, would have been at this time extinct, but for the safety-lamp. The maximum produce used to be only eleven-twentieths, and nine-twentieths were left in pillars, nearly the whole of which has been since extracted with the aid of the safety-lamp. It is true, as was stated some time since in your Magazine, that the loss of life from explosions continues on the average nearly the same; but this is justly attributed by Mr. Buddle to the circumstance that mines are now worked, from having the advantage of the safety-lamp, which could not formerly have been worked without it, by which, of course, the risk is greatly increased; and also to the culpable negligence of the miners in the use of the lamp. Scarcely a month occurs without the punishment of some of the men for screwing off the top of the Davy lamps, and exposing the naked flame for the sake of getting more light, without any regard to the danger run. No want of anxiety to prevent accidents can be fairly ascribed to the coal-owners themselves. The pecuniary loss arising from the destruction of working apparatus and materials, and the interruption given by explosions to the working of mines, is always so serious, that even supposing motives of humanity had no influence with them, it is their interest as it is their practice to take every possible precaution to ensure the safety of their workmen. They have never refused a fair trial to any feasible scheme which has been proposed to them; and, as in the case of Sir Humphrey Davy, have liberally rewarded every service which science has rendered them.*

I am, Sir,
Your obedient servant,
A Lessee.

The Tyne, Sept. 15, 1832.

PROPOSAL FOR A COMBINATION OF RAIL-ROADS WITH CANALS.

Sir,—Your extract from the *Glasgow Chronicle*, p. 91, called to my recollection the advice given some time ago by several of your correspondents, viz. that as the canal proprietors were already in possession of some of the best levels in the kingdom, they could not do better than fill up the canals and construct railways in their place: but an attentive perusal of the facts contained in the above named extract, together with the experiments detailed in the Mech. Mag. for Aug. 7, 1830, and July 9, 1831, has raised a doubt in my mind whether that would be the best course for them to pursue, and has induced me at the same time to propose for their consideration what occurs to me to be a much better, as well as a more economical, plan of procedure. At all events the experiment may be tried at a comparatively trifling expense.

The experiments on the Ardrossan sufficiently prove that nine or ten miles an hour is maintained at a less expenditure of power than any lower rate; but it must not be inferred from this that a higher speed, say twelve or fourteen miles, may not be still more economical, although it is quite clear it is not attainable by animal power, it having been proved that two horses, drawing from nine to twelve tons, can never exceed ten miles

* We should not like to judge of the liberality of the coal-owners by the case of Sir Humphrey Davy. He received, if we recollect right, a piece of plate worth £1,000; while the coal-owners have been benefited by his invention to the extent of perhaps a million.—Ed. M. M.

an hour. But mechanical power is not thus limited, as by it any speed may be obtained that experiment may prove to be most effective. My opinion, grounded on what has already been done, is, that instead of filling up their canals, the proprietors would find it far more advantageous to construct railways on their banks for the purpose of towing boats by locomotive steam-engines instead of horses. I will conclude with stating some of the advantages that must arise from a combination of rail-roads with water carriage.

1st. The expense of forming a new line of road is obviated.

2d. The cost of the rails would be much less than if the road had to be constructed for the transportation of merchandise, and the power required being small, the engines as well as the rails might be of the lightest description.

3d. Economy of power; as it appears the effect produced by this application of power is about treble that which is recorded (Mech. Mag., April 3, 1830,) as having been performed under the most favourable circumstances on the stone tram-way in the Commercial-road; it also exceeds the performances at the competition on the Manchester and Liverpool railway, and its advantages over paddle wheels will, in many respects, very much exceed both.

4th. The boats not having the engines to carry, nor being subjected to any unusual strain, will of course require no extra strength in their timbers, and consequently will draw no more water than those in present use; neither will both power and boat have to lie idle while one only needs repair.

I remain, Sir,

Yours respectfully,

TREBOR VALENTINE.

Derby, Dec. 15, 1832.

ACCIDENT FROM HANCOCK'S STEAM-CARRIAGE.

[A very erroneous account of an accident caused by an explosion of the boiler of one of Mr. Hancock's steam-carriages, having appeared in the newspapers, we are glad to have it in our power to lay the following authentic particulars before our readers. It will be seen that the accident arose from no defect in the boiler itself, but from the negligence of the individual who had the misfortune to lose his life.—ED. M. M.]

On Saturday last (the 22d inst.) an inquest was held by the Coroner of Essex, at the Harrow Inn, Stratford, on the body of Richard Outridge, an engineer in the employment of Mr. W. Hancock, of Stratford, who met his death on Thursday under the following circumstances:—George Bish, foreman to Mr. Hancock, deposed that the deceased, who had been some months in the employ of Mr. Hancock, was with other workmen putting the machinery of a new steam-coach in action on the premises in order to try its performances. The witness described the peculiar construction of Mr. Hancock's chamber boilers, and deposed that there were two safety-valves on the boilers in question, one of which he had himself weighted to the pressure of one hundred pounds upon the square inch, the deceased undertaking to adjust the one on the other side of the boiler to the same pressure. The witness then left the carriage for a short time, and on his return discovered that the steam was blowing off very powerfully from the valve which he (the witness) had adjusted, and that the sides of the boiler were rapidly distending. Witness called to the deceased (who was standing in the engine room of the coach, with his back to the boiler, examining the working of the engines,) to throw off the blower, by which means the fire would have nearly ceased its action, but that the deceased replied he had forgotten to fix the lever on; the deceased then stopped the engines; the witness cast his eyes to the valve which had been left to the care of the deceased, when he saw it fastened down by a strong copper wire; he called to the deceased to relieve it, but before he could effect this (through the wire being twisted several times round an iron punch which the deceased had strongly driven into the wood framing of the engine room in the absence of witness) one of the eleven chambers composing the boiler was rent, and the great force of the accumulated steam threw the deceased back against the engines. The deceased was removed into the house, and medical assistance immediately obtained, but he expired in about an hour. The witness, in answer to questions from the jury, said that had it been a boiler

as constructed by others years ago, much injury must have ensued from the fragments of metal which would have been driven in every direction, with great violence, amongst the men who were at the time around the coach.

Other witnesses were examined, and on its being ascertained to the satisfaction of the Coroner and jury that the fastening down of the valve was the act of the deceased, the Coroner observed that had the deceased survived, and any other person met his death, in that case the deceased would have taken his trial for manslaughter, from his culpable negligence in the management of a thing which he, by his occupation, so well understood, it being proved that he had been for a length of time engaged in similar work, and was well aware of the nature and operations of steam.

The Jury having minutely examined the boiler and engines of the coach in question, as also of another coach upon the same construction, and which was put at work for the purpose, and all its parts being explained to them, brought in the following verdict—"Accidental Death, *caused by the deceased's own negligence.*" The Jury added, that they were quite of opinion that Mr. Hancock's boiler, from its peculiar construction, was as free from danger as any boiler could be; in which opinion they were borne out on their examination of the body of the deceased, which was not at all mutilated; neither was the machinery nor the body of the coach injured. The deceased, who bore the character of a steady workman, was 28 years of age, and has left a widow and three children to deplore his loss.

BRIDGE-BUILDING AND CARPENTRY.

Letter from the late Robert Mylne, Esq., Architect of Blackfriars' Bridge, to Professor Robison. [*Never before published.*]

Dear Sir,—I am quite ashamed of the date of this letter and yet, alas! I have too many reasons to excuse the lateness of an answer to your last of 25th February. The death of my friend and relation, Admiral Sir Charles Thompson, in March and the cares of his family (as an executor) has occupied my whole time and attention.

I did not receive your favour till the 15th of March, with the first supplemental volume of your work of the Encyclopædia Britannica. As soon as I could I ran over the article you mention relating to Blackfriars' Bridge, and adjusted myself to set about giving you all the satisfaction in my power; but the business above-mentioned disturbed my mind and powers so much that till now I have not been able to say what should be submitted, and even now I am very unfit and incapable to give the information you desire and I wish to do.

I am surprised to find that throughout the whole work you have been able to give us so much accuracy as you have; and yet there are some parts, and some only, so defective as to make our regret sensibly affecting. On *arches*, your principles and reasoning are perfect, and I conveyed much the same, in my humble way, in 1759 *et sequitur*. The matter of the *joggles* was proposed when the *design* of the work, with all the varied particulars for execution, was resolved on generally. When real contracts were to be settled to the amount of 100,000*l.*, it was found useful to omit the joggles in the joints of the voussoirs. The motives were merely masonry and money in London. The principles were mine, and permanency from Rome.

The reversed arch in the spandrils was altered into a level course like the upper one, as a safer method of obtaining the same strength. This was my own variation, from its being to be done in Portland stone, and the *Maidstone* quarries not being able (on inspection) to furnish the material *flat and square* enough for the conception I had entertained thereof at the first flash of invention.

As to the framing *the centres*, you are very accurate, if your draughtsman had been equally so; but the whole of the principles of that design depend on the truth of the lines drawn, and, indeed, it is very difficult to make each part answer properly, as well at the places where each passes through, as at the parts where they cross each other. I will send you a print *of my centre*, and another used at Westminster Bridge. The desideratum of each was different in the mind of the artist, as you will see.

I had the advantage from the fatal sinking of one pier at Westminster works. To understand this, you should know there is not one pile *under* the piers of that structure. Blackfriars' Bridge is

invariably otherwise, even to seventy to one hundred under each pier. The charging all the weight of a building *on the base* provided for it gradually as it advances, and the poising the whole in such a manner as that each part thereof shall weigh (as Shakspeare says) against its opposite—was my uniform reasoning. Hence came the great enlargement of the piers at the foundations that the centres were to be charged upon—then the gradual increase of the weight of the arch and the work on *that base* which, in times hereafter, was to be (or not to be) its perpetual support.

You have been much misinformed on the manner of striking the centres. *That* you describe was tried, but improved into another, which I would willingly give you, but it is too intricate to be conveyed in a letter, and without several drawings. Suffice it to say, there was no concussion, and it was so easy at command (which we obtained during the progress) that I could stand under the key-stone and ascertain the awful *subsiding* of the middle of a hundred feet arch, five feet thick in the middle, and stop or proceed with that motion as I pleased. The hand that writes you this trembled not. Firm minds feel no danger when they poise the scales charged with such enormous weights, if done on principle. One day struck the centres, and after a proper interval of time for observation, to instruct myself and others, another day cleared the arch of all the complicated timbers of a very simple composition.

In *carpentry*, you have given the world much new information in that ingenious art; and yet, as to the *artists* you mention, you have been imposed upon. The roof of St Paul's, Covent Garden, lately done, was by *Mr. Hardwicke*, an architect of abilities; not by *Wapshot*, the carpenter, only of its execution. The roof of Birmingham Theatre cannot be truly drawn, and in the lightness of its composition it goes too near the wind. The roof of Drury Lane Theatre was by *Mr. Holland*, the architect of that structure. The roof of the chapel at Greenwich Hospital was by *myself*: Samuel Wyatt was only the carpenter recommended by me.

The contiguation of timber, in the varied purposes it serves for, is still in its infancy as an art. The works of other countries are not known in this as they should be. I walked through and over the Alps, and have been in some measure the means of bringing forward a knowledge of great works in this way in that country. The works of *Zubaglia*, at Rome, should be published here. The cupolas of St. Peter's and St. Paul are a *studio* of themselves in the science of sound building. The first was my school in that line for four years. The latter has been 30 years under my care, and I am not yet tired of admiration and examination. If you have not, you should get a work by Giovanni Poleni on the former, at Rome in 1748, by order of Benedict XIV.

Thus much a leisure Sunday's forenoon has enabled me to recollect and convey to you. But it is only a *sbozzo* of what I wish to have given, and your labours deserve. I am sensible these particulars must appear ungainly to you, for want of those things being known on which they rest.

Finally, I am to thank you for the very civil expressions you have bestowed on my labours. Mine has been a very active life in conceiving and executing: it remains for its wane to register and publish some accounts of its transactions.

Mr Rennie has not thought proper to explain himself about the wager and its foolish purpose. He is laborious in collecting knowledge from others, but is deficient in acts of genius and independence of mind and thought. Your information has a strong bias—I should imagine from my friends Dr. Hutton and Mr. Thomas Collinson. You will excuse the freedom I take by exhibiting these suppositions. If you would send me the friend in London, to whom I could explain myself for your better information, I would avoid the errors which this hasty sketch of such extensive subjects may create in your opinion.

I am, &c.

London, May 12, 1799.

SAFETY VALVES.

Sir,—There seems to be three causes in co-operation to produce the effect stated by Trebor Valentine, in your present volume, p. 26.

1st. The pressure of the steam at the orifice, through which the wire of the float enters the boiler. This pressure is proportioned to that on one inch of the

safety valve in the ratio, of the sectional area of the wire to the area of one inch of the safety valve, and it is exerted so as to elevate the float above its due level in the boiler: consequently, when the pressure is diminished, the float sinks.

2d. Water swells on the access of heat in a certain ratio; this ratio is ascertained as high as 212° of Fahr. and under the atmospheric pressure: it may therefore be presumed, that, as water is scarcely compressible mechanically, this enlargement will not be restrained from proceeding in some ratio on the access of higher degrees of heat and under higher pressure. If, then, the heat applied and the pressure remain constant, the water will accumulate heat and bulk proportioned to the pressure; the steam also will accumulate a degree of heat in its own peculiar proportion, and become saturated. In this state, if a quantity of steam be allowed suddenly to escape, the remaining steam expands, and thereby has its capacity for heat suddenly renewed, so as to produce the effect of a great degree of comparative cold in contact with the water. The water forthwith parts with a large portion of its accumulated heat, loses bulk in proportion, and so the float sinks. My 3d cause is only hypothetic, viz., if the float is of such material as to be only partly immersed in the water. In this case, the part immersed in the steam will lose specific gravity in proportion to the density of the steam, viz., in proportion to the pressure: therefore, if the pressure be diminished, the specific gravity of the float will be increased, and it will sink.

I am, Sir,
Your obedient servant,
Φ. M.

WHAT IS DUE TO THE PARENTS OF USEFUL INVENTIONS, AND IN WHAT MANNER THEY ARE GENERALLY PAID BY A DISCERNING PUBLIC.

Sir,—A contemporary Journal has furnished us with the History of the Persecution of Genius, during what may truly be termed the days of mental darkness, or, as some will have it, during the progress of "the wisdom of our ancestors." That the sun of knowledge has arisen on our benighted world, and to a certain extent abated the persecutions, no man can deny. But the blessed light of true knowledge must shine much brighter before we dare say that genius is truly rewarded. Your Journal of the 20th October last, bears out the fact most incontestably.

It is surely not irrelevant, in remarking on "Notes worth Notice," to observe that, in the same number of the Mechanics' Magazine, is a drawing and description of the first steam carriage, by the son of the inventor, William Symington, that ever moved on the face of the *earth by the power of steam*,—consequently, the parent of all the locomotive engines impelled by steam that have subsequently followed it. In an article in the same "Notes worth Notice," the author of Waverly is termed "The greatest name of the nineteenth century." If utility, then, not fancy or amusement, is to be the scale or standard by which the claim to true greatness is to be measured or weighed, I will here ask, whether the man and the mind that first conceived, and had afterwards the courage and perseverance to execute, modes of conveyance both by land and water, and which are now progressively changing the mode of intercourse between distant nations, so as ultimately to change and improve the whole commercial and social systems on the face of the globe,—ought not he to be named, in conjunction with James Watt, as a greater name than any novel writer, from Cervantes down to Walter Scott, whatever might have been their particular merits in writing works of fiction. There has hitherto been two national modes of honouring and rewarding merit, and to both, Mr. Symington, had as great a claim as any name of the nineteenth century; and of both, himself while alive, and since his death his widow and family, have been most unaccountably deprived, and were and are now equally unnoticed or unrewarded, either by the government or by public subscription. We will here, if you please, compare the merits and rewards given and still intended for the author of the Waverly Novels. With the criminal neglect experienced by William Symington and family, both from the government and people, who are indebted to his mighty mind for an incalculable saving of labour already effected, and for a still more incalculable saving in prospect, including the protection extended to the animals subject to man's dominion, who, in the absence of steam power, have too often been wrought to death to gratify a boundless love of pleasure or avarice. The author of the Waverly Novels had, in the sale of his works, an unprecedented one, and for them very liberal prices were given, which he, as a good and truly great man was ever ready to acknowledge. If, he, however, afterwards was led into great

difficulties they arose out of circumstances over which the government and public had no control. There was, therefore, no ground for either complaint or compensation. Not so with the case of the parent of both steam carriages and navigation. He spent a long life and his all to benefit his own species and the labouring animal, perhaps to a greater extent than any man that ever preceded him, and yet had not even the cost of the hundredth part of his time awarded him, without our taking into account his painful struggle against the shameful neglect of those who are now as ready to take advantage of his invention, as adverse to reward the family or honour the memory of the inventor. In short, he in all things succeeded but in one, and that was in his not being rewarded as he ought to have been by both government and people.

How stands the case between the country and the author of the Waverly novels? The Government, for his being a poet, conferred upon him a place of considerable emolument, which he resigned only about two years before his death. For his other works in prose he was deemed worthy of a hereditary title. And now, when dead, his memory is to be honoured by splendid monuments, and his children plentifully provided for by a generous, certainly, but not a very discerning public. Mr. Editor, can such a flagrant instance of ill-judged partiality stand a moment's investigation?—Is not every penny thus raised for the family of Sir Walter Scott the severest sarcasm that foreigners may justly fling at our country until something like common justice is done for the memory and family of Mr. William Symington, the undisputed parent of steam coaches, and of practical steam navigation? Think only, Sir, of the baneful example set the world when the man of fancy is so munificently rewarded for his works, while the ingenious mechanic, who has been selected by Providence, like another Christopher Columbus, to teach men, if not actually the way to new worlds, at least the way to make the most of all that we at present know of both old and new, is utterly neglected. True, the simple-minded individual, who never thinks what merit is due to the original discoverer, will, after the thing has been made easy to them, say, "Why, it is nothing to do what Mr. Symington has done; nay, we can do better than he did." Truly, ten thousand or ten millions of men have gone to America since Columbus led the way; but the question is, who showed them first the way? They only followed.

If the Schoolmaster is abroad to teach men those most worthy of honour and reward, I am certain he is not in the employment of "The Society for the Diffusion of Useful Knowledge." In their Penny Magazine there appeared lately an article, extracted from an account published at New York, awarding to Robert Fulton, of America, the right and merit of being the original inventor of steamboats. Knowing, as I did, the complete falsehood of the thing, I wrote them, and asked them if the dissemination of a notorious falsehood was the diffusion of useful knowledge? If so, I had nothing to add; but, on the other hand, if the correction of falsehood were a matter of any consequence to them (as I give them credit for not wilfully sinning), I would put them right. To make surety doubly sure, I referred them for proof to the Journals of the Royal Society of London, where they would find ample proof that they were not only doing a very great injustice to their own country, but likewise to the memory and family of the deceased Mr. William Symington, who was the man who had taught Fulton how to construct the machinery to impel vessels by steam.

What then must have been my surprise, Sir, when a Society, at the head of which is Lord Brougham, in place of referring to home documents to correct a most palpable falsehood, after some delay, and in a most flippant manner, replied to my communication by saying, they were content to let the matter rest as it was, as Judge Story's account of the matter from New York was fully sufficient for them—*the plan of their work not permitting them to sift out the truth.*

Desiring most sincerely, Sir, that right alone should prevail over might, is the wish of

ROBERT LYON.

Willowfield, Upper Clapton, Middlesex,
December 24th, 1832.

RAILWAYS IN THE UNITED STATES.

(Extract from the Letter of an English Traveller.)

"I find that the immediate obstacle to the use of the locomotives in this country arises from their great weight, which crushes the iron rail into the wooden runner which supports it. These wooden runners will all be gradually exchanged for stone as they decay, which material can now be bought at a moderate rate, when they do not anticipate any difficulty in making locomotives equal to the English. Other rail-roads are forming in all directions; and both in these, as well as canals, this infant country already far surpasses us in the extent of their application. There is no want of capital for any undertaking."

DEFENCE OF COACH-BUILDING, AND A FEW WORDS ON STEAM-CARRIAGES.

Sir,—Your correspondent "Junius Redivivus," whose pen seems to have been plucked from some remarkably pugnacious member of the feathered tribe, has in his last made a furious attack on the fraternity to which I happen to belong, and upon their works; and although, like many of my brethren, I am not skilful in the use of words, I shall venture to state a few facts in reply to his remarks.

"Junius" says that the writer in the *Foreign Quarterly* "is evidently no practical mechanic," or he would not have inserted what "Junius" pleases to call a high-flying hyperbole, viz., that one of the best made London carriages is nearly perfect. And because the reviewer expresses in somewhat glowing language his admiration at the "exquisite structure, simplicity of appearance, beauty of form, proportions," &c., and observes it would require a lifetime to understand a carriage, "Junius" is pleased to say "that such trash is quite sickening."

Now, if "Junius" knows any thing of the construction of carriages, let me ask him what improvements he can suggest to be made on a modern coach or chariot, *as built by the best makers*, with the under springs as praised even by "Junius"—the patent axletrees invented by the ingenious Collinge,—and the body suspended by braces upon C springs—a form which, in spite of "Junius's" appellation of "barbarous," I can confidently appeal to all mechanics and men of taste as being scientific in principle and elegant in appearance? I can with equal confidence ask all who are competent to judge, whether the combination of lightness and strength to be found in different degrees in the timbers of such a carriage,—the nicely balanced supports given by the iron-work, proportioned to the demand for strength,—the beautiful and harmonious lines in which the parts of the body and carriage are arranged,—the capability of being put into rapid motion without the least noise among the various and complicated parts of the machine, and of conveying its occupants in luxurious ease in spite of every obstacle opposed to its progress—do not altogether present a triumph of skill well meriting the highest admiration? I moreover fearlessly challenge "Junius" to point out any deficiency, or superfluity of material, notwithstanding his classical allusion to the pig and the post, when speaking of the knowledge of those who construct vehicles such as I have described; and which, when intended for travelling, evince the practical skill of their constructors, by frequently making the tour of Europe without a bolt leaving its place during the journey.

"Junius" says, there has been no alteration in the mechanism of carriages for many years past, and that the form they have taken, being lines formed out of the ellipse, is not by design, but a necessary consequence of their mechanical construction.

Now, with regard to the first assertion, besides the carriages named, I might instance many others, which have undergone very great improvements in their mechanical structure, as well as in other respects; but as a carriage must always, like a house or a ship, be suited to its destination, they still of course retain certain general characteristics.

As to the second objection, it is sufficiently notorious that the old shape of coach bodies resembled a sarcophagus, as may be seen in the Lord Mayor's coach, and other antique specimens of the art, and that the adoption of elliptical lines has been the result of improved taste. The return curve (Hogarth's line of beauty), which is very freely used in carriage-building, is a tolerable evidence that the builders are not totally ignorant of the rules by which beauty is produced. Indeed, in one instance, it may be objected that security has been sacrificed to appearance, the curvature of the perch being in that direction calculated most to weaken it; but this is amply provided for by iron plates on the sides presenting their edges to the strain upon them.

"Junius" objects to the black colour of the upper parts, and styles it an absurdity. It appears to me, on the contrary, to be a judicious method of throwing the least handsome parts into the shade, thus showing up the shape of the remainder to the greatest advantage,—just as the hair of the head improves the human countenance. I should as soon expect to improve the beauty of my mistress by shaving the hair from her head, and presenting her bare and polished skull, as to improve a coach body by painting it all of one colour.

As to setting up the men of putty, &c.

as superior in intellect to those who tread in the steps of Watt and Smeaton, "Junius" has not shown that the reviewer has done so, nor do I mean to make the comparison; although I may perhaps be allowed to remark, as "Junius" lays so much stress on *calculation*, that these men of superior intellect once built a vessel called the "London Engineer," the joint progeny of their collective wisdom, and which they *calculated* would go as ships usually do, head foremost, but from some error, instead thereof it progressed from Westminster Bridge to Waterloo, with its stern first—a circumstance not to be paralleled in all the annals of carriage-building!

There is, however, at present no necessity for coachmakers to be James Watts', simply because a carriage is not a steam-engine. The latter could not be constructed to act at all, except upon accurate mathematical principles, and could never have existed except in an advanced state of science. Carriages, like ships, are of high antiquity, and each succeeding year has added something by way of improvement. It is idle, therefore, to censure a body of men for not having an abstract acquaintance with the sciences connected with their pursuit, more especially when their works show a practical knowledge sufficiently extensive to adapt them to the purposes for which they are required. In the case of carriages, experience has shown the strength wanted, and there is not a sufficient variation in size to call for such abstract experiments as are indispensable, previously to constructing engines of greatly differing magnitudes with any hope of success.

As respects steam-carriages, I think with "Junius," the springs should not be horizontal, and am only surprised that scientific men should have used such, as their action must interfere with the working of the engine. C springs will perhaps answer every purpose. The wheel "Junius" proposes, may do very well, for aught I know, as applied to a steam-boat, but I apprehend the resistance of water and of land are widely different; and I cannot conceive a wheel can be too near a perfect circle. If the projected springs act at all, they must cause the form of the wheel to be perpetually vibrating between a circle and an ellipse, a variation, I conceive, very unfavourable to the progression of a carriage.

I must not omit to notice the suggestion for preserving the inner surfaces of spring plates from rust by tinning them, and should like to see it tried, although two objections at once present themselves; one is, that the action of the springs, causing a rubbing of the plates, would probably remove the tin after a little wear; and the other is, that the flexibility of the steel would be injured by the process of tinning.

Although "Junius" sneers at the idea of its requiring a life time to understand a carriage, I think he must admit that the subject is an extensive one; and if he is disposed to give the world the benefit of his knowledge, there is an ample field for a course of lectures "On the substances and arts employed in the construction of wheel carriages." I shall, for one, with pleasure attend as a pupil, although, if he brings forward nothing better than he has yet done, I am not very sanguine in my hopes of advantage.

In conclusion, I say with the reviewer, "Let us adopt the best-made London carriage, with all its improvements, and if we can succeed in any thing, it will be in propelling such a vehicle;" but I beg to be understood as meaning *not to convert it into a steamer*, but to have the power on a distinct carriage, substituting a steam engine for the horses; and by this means I hope, ere long, to see travelling performed with as much comfort, and I might perhaps say luxury, by all classes, as it now is by the aristocratic few,—an event I shall hail with sincere delight, and which I should be happy were it in my power to accelerate.

In the foregoing remarks, I allude solely to the best built London carriages,—*the reviewer's words*. I am aware that the number of good builders is very few, and the mass copy from these with various degrees of success, according to their skill. Improvement in the public taste will cause a corresponding improvement in this, as in other matters; and, ere long, I hope to see good carriages more general than they now are, being at present, I admit, a very small minority.

I am, Sir, your obedient servant,

PHAETON.

MISAPPLICATION OF SUSPENSION-BRIDGES.

Mr. Editor,—In your Magazine for Nov. 17, 1832, you notice a work on suspension-bridges by C. S. Drewry; and after lauding him for being impartial, extract

some judicious remarks on their application, of which the following are part:—

"Its (the bridge of suspension) next most valuable qualities are the facility and expedition with which it can be built, and the consequent economy. These advantages, added to the elegant lightness of suspension-bridges, have combined to throw a degree of charm about them, which is perhaps becoming exaggerated, and may lead to their adoption in unfitting situations."

In illustration of the foregoing, allow me, Sir, to observe, that while at Stockton, in August last, I noticed what I conceive to be a misapplication of the suspension-bridge.—In an extension of the Stockton and Darlington Railway, they had occasion to cross the river Tees; to accomplish which, they have erected a bridge of suspension, by the advice, and under the superintendence, we must suppose, of the company's engineer: and I am told (for I have not seen one), that while the work was in progress, engravings were published, representing a "locomotive," and long train of waggons passing over it. But what the result has been, shows a sad miscalculation, as I myself can testify; for when I saw it, *two* coal waggons, of a gross weight of four tons each, were suffered to descend freely on an inclined part of the road, of about 600 yards in length, accelerating till they arrived at the bridge, which, from their acquired velocity, they passed rapidly over; but I assure you that I, a spectator of the affair for the first time, felt considerably relieved when I saw them fairly across: in short, it is a mode of passing heavy carriages over a river so singular that I hope never to see a "second edition" of it.

The bridge, at a guess, is about 40 yards between the piers, and the roadway, and also the rails laid over it, curve upwards, I should think (when at rest) two feet; yet, while a pair of waggons are *in transitu*, for the first half of their passage the roadway is depressed at the point where they are for the instant, and elevated, like a wave, a little way before them. During the latter half of their passage the wave is behind, the suspending chains meantime assuming the same appearance (though in a less degree) as a slack wire, when the performer moves him or herself to different points thereof; the *greatest* depression of the roadway below the horizontal or springing line appeared to be about 18 inches, and the state of the trussed railing showed the strains to which it had been exposed.

As these are merely the observations of a passenger looking at it for half an hour, perhaps some of your Stockton correspondents (for I presume you have readers and occasional correspondents in all towns) could say what is thought of it by those who have daily opportunities of seeing it used; for my part, I think "such *things* are dangerous."

I am, Sir,
Your obedient servant,
J. SYNGLEMAN.

Derby, December 17, 1832.

N. B. It would be valuable information if your correspondents, near the various public railways finished and in progress, would send you drawings of the rails and pedestals, with the method of fixing the rails in them, as each engineer seems to have a plan of his own.

KYAN'S REMEDY FOR THE DRY ROT—MR. MUDIE'S THEORY OF ITS ORIGIN.

Sir,—In reply to Mr Kyan's letter, inserted in your Magazine of yesterday, I have only to refer you to the inclosed copy of that gentleman's circular announcement of his invention, in which, though there is a great deal said of the results of the process employed, there is not a syllable explanatory of the process itself. The specification must doubtless contain all about it; but Mr. Kyan must have been well aware that thousands would see his circular who might never have an opportunity of referring to the specification.

I am, Sir, your obedient servant,
PERTHENSIS

Dec. 23, 1832.

The circular forwarded to us does certainly contain no description of the process itself; and the omission is of a nature not easily to be explained on any other ground than a desire of concealment; seeing especially that a couple of lines would have sufficed to give all the explanation necessary. Mr. Kyan's process is simply this:—He immerses the wood in a solution of corrosive sublimate (one lb. of the sublimate to 5 gallons of water) till it is thoroughly saturated. Mr. Kyan states in his circular that it is four years since he addressed his present

Majesty, then Lord High Admiral, soliciting his Royal Highness to permit a trial of timber, prepared according to his process, to be made in one of his Majesty's dock-yards, and that, in compliance with instructions from the Comptroller of the Navy, he prepared a piece of English oak, which was, on the 9th of June, 1828, submitted to trial in the pit, subject to foul air and fungus mould, for trying and proving the durability of timber, at the dock-yard at Woolwich. About two years afterwards, namely, in the month of March, 1830, Mr. Kyan applied to the Navy Board for an inspection and report thereon, but was informed, in reply, that the Commissioners did not consider that it should be examined under three years at least, "as no inference could be drawn of the effects of his process under that period." At the expiration of three years Mr. Kyan again applied, when the inspection was granted, and the officers of Woolwich-yard reported the wood to be *sound*. In compliance with a further order of the Navy Board, Mr. Kyan prepared nine pieces of oak, sent him from Woolwich-yard, where nine duplicate pieces were retained, all being marked by the proper officer. Of these specimens, five pieces, with their duplicates, were on the 9th and 10th of August, 1831, inserted in timber totally decayed with dry rot, in the Thalia frigate, stationed in the river at Woolwich; one other piece and its duplicate in the decayed timber of the dry-dock; and the three remaining pieces and their duplicates in the before-named pit at Woolwich-yard. In February, 1832, Mr. K. had the whole of the nine pieces and their duplicates inspected, when the entire of those prepared by him were found in the most perfect state of preservation, without *spot* or *blemish*, while all the unprepared duplicates had taken the infection, being covered with fungus mould. Mr. Kyan, therefore, on the 29th of February last, addressed the Lords of the Admiralty, requesting an inspection and report thereon by the proper officer, to which he received a reply, stating that the matter would receive further attention and consideration by Government, and the result of these reports, when received, be communicated to him in due course. In the meanwhile, "by the advice, and under the kind recommendation of some of the Lords of the Admiralty," he took out a patent (31st March, 1832,) for his invention, and "their Lordships have been pleased to say they will purchase of him the privilege of its use for his Majesty's yards, leaving him at liberty to sell to other Governments and to the public generally."

Mr. K. states that the invention is equally useful as a preserver of canvass and cordage, and that he has several pieces of canvass prepared by him with his solution, which have been submitted to the strongest test; having been for six months in damp in a foul cellar, but are in no wise deteriorated, whilst the duplicate pieces in their natural state are totally covered with mildew, and are for the most part rotten.

Mr. K. states it to be "a well-known fact, that no piece of timber was ever found to sustain itself in soundness half so long as Mr. Kyan's has done in the pit at Woolwich;" and that "it usually gives way in about six to nine months." Of the nine prepared pieces and duplicates, four were of seasoned, and two of unseasoned or fresh English oak, and three of American oak.

The time required for saturating any description of timber is about fourteen days, and it is fully seasoned within two months from that period. The process imparts no colour whatever.

We have no desire to question the originality of Mr. Kyan's invention, and if his dates are right we see no ground on which it can be impeached; but it may not be out of place to mention that, in the Reports of the French Society for the Encouragement of National Industry, for last year, there is an announcement of a process for the cure of dry rot having been discovered by a M. Breant, which seems to promise a close resemblance to that of Mr. Kyan. The passage is as follows:—

"At the meeting of the Society on the 21st of December, M. Breant, Assayer of the Mint, and an able chemist, exhibited several pieces of wood, of many inches square and several feet long, which had been prepared by him according to a new process, which is expected to preserve them from every species of decay. The details of the method have not been made public by M. B.; he has merely stated that the wood is soaked in saline solutions and in oily and resinous matters. These substances penetrate so completely throughout the mass of wood, that when

one of the blocks exhibited before the Society was sawed in half, in presence of the members, it was found to be thoroughly impregnated with them, even to its very centre. Mr. B.'s process requires but two or three days for completion, even in blocks of wood of a large size."

While on the subject of dry rot we cannot refrain from inviting attention to a very ingenious, sensible, and, as far as we know, original theory of its production, which we met with in a recent volume of Constable's Miscellany, entitled "A Popular Guide to the Observation of Nature," by Mr. Robert Mudie,—a book, by the way, conceived in a singularly philosophical spirit, and to which we must some day soon pay our critical respects in due form. Mr. Mudie, after observing how entirely the dry rot is a disease of modern times, proceeds thus to inquire into the cause:—

"Well, what is this dry-rot? '*Xylostroma giganteum*, which grows in the timber like a thick, broad patch of dull yellow leather, or *serpula distruens* in other instances, which is smaller, redder in the colour, and whitish at the edge, but that last is as often found upon other timber as upon oak.' Well, that is not a point worthy of much dispute; the timber is destroyed, and, generally speaking, these (the *Xylostroma* and *serpula*) are fungi: but it is just about as sensible to call these fungi 'dry rot' as it would be to call flowing blood 'a wound,' or the worms that consume the body 'death?' Why come the fungi there? There was a time when dry rot was unknown; and as long as the beams of houses were of good oak, or chestnut, or red pine from the north of Europe, there was no information laid against serpula. Besides, there never appeared a single fungus of any species upon or near the piece of oak in the experiment, and yet it passed from what may be regarded as the best state that it could be in for duration, to absolute uselessness, in so short a time, that if a ship were to decay as fast, the whole freight that could be obtained would not pay for the trenails. How is the same dry rot to be got rid of? 'Oh, wash the timbers with sulphate of iron, and other saline solutions, and let the ship, or the house, as it may be, be well ventilated.' The old story—'Call in the doctor, apply a lotion, and exhibit a bolus,' under which the diseased have continued to die ever since medicine was a science. Are ships kept less clean now than they were before the dry rot was heard of? or are they or houses worse ventilated? Truly not. If there be any difference, the ships must be kept sweeter, else the chlorides, and other powerful fumigations, have been invented and applied to little purpose. The crews certainly keep their health better than they did formerly; and it would be somewhat wonderful, if air, which were more wholesome for human beings, should be more deadly for oak timber! As for the houses again: there are certainly more underground apartments than there were once, and possibly more than it is wise to have. It may happen, too, that the tax upon windows has impaired the ventilation by those apertures; but in many of the modern houses, and those especially where the rot appears, the loss of ventilation by windows has been more than made up in ventilation by walls, many of which are so thin, and of materials so infirm, that, in as far as air is concerned, the fabric is ventilator all over."

"But fungi, by what names soever they may be called, are not locomotive destroyers; they do not, full grown, career over the land and the waters, to prey upon sound timber, as hawks do to prey upon birds, or wolves to prey upon sheep. The *sporæ*, or whatever else the small and generally invisible germs of the fungus may be called, are perfectly passive, and of themselves can do no more harm to an oak beam than could be done by a mustard-seed. The soil, in which alone it can germinate, or *begin* its action, is rotted wood. If it meet with that it will germinate; if not, it will remain inactive. There is no doubt that the increasing quantity of rotted timber has increased the number of those plants; but that has in no way altered the law of their nature, which is to grow in rotten wood, but not in wood which is sound. The only rational view of the case, therefore, is that the timber must be rotten before the fungus can act even in the slightest degree; and that, consequently, the fungus is produced by the rot, and not the rot by the fungus; and though the fungus is destroyed, the rot will go on probably as fast as if the fungus were not there; only, as the fungus has a great attraction for moisture, and as moisture, though not the cause, is an instrument in producing the rot, the fungus may, when it appears, hasten the destruction."

"Imported oak has been blamed for this decay; and it is true that the imported oak, and more especially the oak imported from America, is inferior to the oak which *once* grew in the forests of England. But the deterioration is not confined to the imported oak; and however bad that may be, it could not inoculate the oaks of the forest with its deleterious qualities, any

more than the species of insect called American blight, which infests apple-trees, could take its departure for Hereford or Devon, immediately on the landing of a cargo of American apples at Liverpool. The rot is in the timber itself —*that* is of an inferior quality; and the cause why it has been allowed to degenerate is, that they by whom oak-trees have been bred have not been careful in the observation of nature, but have proceeded in their operations by means that had no natural foundation. The object of the grower has been to get goodly trees—trees that pleased the eye, without any regard to the quality of the timber; and the bject of the nurseryman has been to rear p his seedlings and get them to market as oon and in as showy a condition as ssible.

"It has been said that the wrong oak has been cultivated, and that may be true; for the very same circumstances which led to the wrong mode of treatment may have led to the using of the wrong plant. The collector of acorns would naturally proceed upon the joint principles of 'the most easily obtained and the most saleable.' I do not know that it is in all cases a positive fact, that the worst kinds of oak are the most prolific of acorns; but it is a sort of generally-observed law among vegetables, that where there is a great deal of fruit, the wood is soft and perishable. And that has reason on its side: trees do not work miracles any more than men do; and, therefore, if its action is more turned in any particular direction, it must be less in any other. Fruit-trees are often killed *in the wood* by excessive bearing; and, therefore, it is natural to suppose that a similar excess must injure the wood of an oak. Now, it generally happens that, in the same species, whether in the same or in different varieties of the same species, the productions run largest when they are most numerous. Hence the acorns of the oak having the inferior timber are the most profitable for the gatherer, both to gather and to sell; and those two circumstances are quite sufficient to bring them to the market in preference to, and even exclusive of the other—more especially as the purchaser is to grow seedlings, and not oak timber. The question of the timber is, indeed, a question seventy years hence with those who deal in acorns and seedling oaks, and as they have small chance of hearing any complaint that may be made about the quality, they of course give themselves very little concern about it."

"Now, if people have been able to cultivate animals into greater size and strength and beauty, and also to make them have better flesh and finer wool; if they have been able to improve by culture the beauty of flowers, and the nourishing qualities of all manner of esculent roots, stems, leaves, and fruits, it would be passing strange if their culture could do nothing for an oak tree, but make it more worthless timber. If all the earth were given to man for improvement, and he had improved much of it—as he actually has done—it would be a perfect anomaly, if timber, which is so very useful, should be the single article on which he could not lay his hand of culture without doing it an injury. It is impossible to believe that such an anomaly can exist in nature; and, therefore, the only way is to catechise the man who makes the attempt; and, if he does not understand what he is doing, send him back to nature to inform himself as to what he should do.

"There is a custom, and a very inveterate custom, which we have, and that is, the custom of generalising analogies. If there be a way in which one thing answers very well with us we are apt to think that same way will do as well in all other things, even though the things are, in their nature, quite different. We go about to persuade ourselves that the way of doing one thing is the way of doing everything, just as Lord Peter, in Swift's 'Tale of a Tub,' went about to persuade his two brothers, Martin and Jack, that the brown loaf was beef, and mutton, and venison, and custard; and as we are always very willing to believe ourselves, we are far more ready believers than Lord Peter's brothers.

"Now, in all our cultivations of vegetables, there is none, save that of timber trees, in which the quality of the wood is any consideration; and there is, perhaps, none of them in which the wood is not actually deteriorated by the culture. In the grain plants that is decidedly the case. Straw is very inferior to hay in strength, in flavour, and in every quality. The more highly, too, that the grain plant is cultivated, and the more abundantly it produces seeds—the grand object of the culture—the straw is always the worse. In the cold districts, where the crops of stunted oats are barely worth the gathering in, and would not be worth it at all in a place where labour was high, the straw is rich and sugary, whereas the straw of barley or wheat, grown upon land in high condition, is perfectly insipid. The former, too, is tough and firm, the latter soft and brittle, with little or no substance in it of any kind.

"It is the same with all the plants. One object is to obtain a certain part of the plant more abundantly and in higher per-

fection than it exists naturally, and we can obtain that only at the expense of the other parts. Compare a crab-stick with a similar portion of an apple-tree,—a hazle-twig with one of filbert, a black-thorn with a plum (if any or all of these be respectively the wild plant and the cultivated of the same species), and see how inferior the wood of the cultivated tree is to that of the other. 'The wild wood' is just as superior in life as it is in strength. We have difficulty in keeping the cultivated plants 'rooted in,' and we have as much in getting the wild ones 'rooted out.' A very little observation of nature, and a few very simple reflections on that observation, might have shown us that that must have been the case; and had we taken that trouble, and very small trouble it is, we should never have gone about to cultivate timber in one plant by the very process whereby we destroy timber in all other plants. Yet we have done, and we continue to do that; for, grafting excepted, we breed oaks and peaches in the same ground, and much after the same manner. We may make some difference in the mould in which they grow; or we may choose that which we fancy will be the best for each; but we do not even that as observers of nature, at least as very attentive or close observers; for our good soil for oak is that on which we have seen large oaks growing, whether the timber of those oaks happened to be good or bad."

Mr. Mudie then proceeds to inquire how nature proceeds in the production of one of the old "hundred year oaks":—

"When the acorns are sown by nature, the are sown *on* the surface, not under it. The sprout tends downwards, as if to reach the ground, while the acorn lies on its side upon the surface; though even then the little tubercle which is to become the tree keeps its apex upwards. It is evident, therefore, that that part of the process is *naturally* done in the air; and, though seeds are better to have the light excluded during what may be called the 'fermentative' part of the process of germination, which is the earliest stage of it, yet, in the case of the acorn, that is over before the shell is ruptured.

"Now it is very much to be suspected that it is at this early stage that the mischief is done; and I am the more inclined to that opinion from the fact that the practical men seem to know very little about the process of germination, even in those seeds which they are sowing by thousands, nay, millions, every year,—there is not much, indeed, in the professed writers on Vegetable Physiology. The agency of light was not understood in the days of Grew and Malphigi; and though that agency be better understood now, there has not been *very much* added to the other branch of the science. Besides, the buried acorn does appear to make some sort of effort to come to the surface, and when it is there the cotyledons acquire a greenish tinge, which they do not acquire when buried; and that clearly shows that in their *natural* state they give to the food with which they supply the young plant some of that preparation which vegetable matter receives from the action of light. The condition of all blanched and etiolated plants, compared with that of the very same species freely exposed to the air, clearly shows that *carbon and astringency*, the very things in which the perishable oak timber is deficient, are among the principal results of the operation of light. These additions appear to hinder rather than forward mere growth at the time; for an etiolated potato will rise thirty feet in the dark, whereas it would not rise as many inches if exposed to the light; but in the case of timber, there is a gain in consolidation, and that is the main point.

"The way in which the parts of the oak 'come,' farther show the importance of light to it at the very instant the plumule begins to move. By that time the root has penetrated to a considerable depth, and is furnished with absorbent rootlets. The nourishment which these procure cannot be acted on by the light in them, aud the plumule, being just beginning to move, has no leaves, so that, if the cotyledons are buried in the earth, the oak must begin life with all the weakness of an etiolated plant; and if it begins without the carbon and astringency that are necessary for good oak timber, the timber of it must be bad, how long soever it may stand, or what size soever it may attain. Future treatment may make it grow faster or slower; but no future treatment can change the character with which it starts. If it starts good timber, it may be stunted or deformed, but it will be durable; and if it starts bad timber, it may be showy, but it can never be good."

"Want of the proper action of light at 'starting,' is not the only injury which timber trees sustain, by the way in which they are grown for the market. They are sown so close, that while they remain in the seed-beds they want both air and light. A seed-bed of pines, in the early stage of their growth, resembles a plat of moss more than anything else: and when it is considered that, in the situation where

they are native, the pines stand singly and are exposed on all sides to the action of very keen air, it must easily be seen that they cannot acquire their due strength when huddled together to the number of many hundreds on a square foot. Those who are familiar with pine forests, or pine plantations, must be aware that the seeds of the cones never germinate under the thick shade of the trees, and grow up so as to form an underwood in the forest. Cones in abundance are produced every season, but they contribute chiefly to the food of the animal inhabitants, and it is only where a blank occurs, from the decay or the casual destruction of a tree, that young plants rise to fill it up. There are, indeed, few or no trees, of which the young plants grow and form underwood, while the old ones remain filling the air above. Nor would it be in accordance with our general observation of nature if they did. The young of no tribe, vegetable or animal, are the destroyers of the old; they merely come on, in succession, when they are required; and though the germs of all are exceedingly numerous, so that there never is room on a fit soil at the proper season, without the plant appearing to fill it. But man comes in with his nursery-bed; and though he cannot be said to overstock the country (for there can hardly be too many trees—and there are numerous and wide wastes in England, where it is disgraceful that there are not millions;) yet the nursery-bed is overstocked, and the consequence is, the dry rot in oak, and general rottenness and want of strength in all timber."

"The commercial advantages of having nurseries for forest trees, as well as other plants, near great towns, are so many and so much more obvious than the injuries that may thus be done to the trees, that many of them are in very tainted atmospheres. Ground there is high rented, and the plants are in consequence huddled together as closely as possible, both in the seed-beds, and after they are transplanted. Still with the rich soil and skilful management in such places, the trees rush up quickly and look well, so that they are more 'taking to the eye,' and so fetch higher prices, than if they were to produce better timber. Indeed those plants, inferior as their timber must be, are actually the most acceptable to the immediate planter. Most species of forest trees are so long in coming to maturity, that the grand incentive to the planting of them is ornament and not use. Even the man who accumulates for posterity, in reality seldom does so in his own feelings of the matter; for he who leaves the mot to others when he quits the world, did not collect it for them, but for himself—for the gratification of his desire of possession. The man who plants wishes to have something to look at, and to have it as speedily as possible, and that, with the other circumstances that have been noticed, conspires to cover the rich districts of the country with growing rubbish, which, when it comes to be cut down, is fit only for firewood, and very inferior for that."

EDUCATION OF THE WORKING CLASSES.—REPLY OF MR. DOWNING.

Then let us pray that come it may,
  As come it shall, for a' that,
When sense and worth, o'er a' the earth,
  Shall bear the gree, and a' that,
* * * * *
  It's coming yet, for a' that,
When man and man, the warld o'er,
  Shall brithers be, and a' that.

BURNS.

SIR,—As your worthy correspondents, Mr. Potts and Verax, have been kind enough to think my remarks worthy notice, it is only a part of common courtesy to give a prompt acknowledgment.

There is a wide difference between "kind and benevolent sentiments" and acts of service; but I am no less grateful for the former, although, by some fatality, they may not have produced the latter. The truth is, the former have been too often mistaken for the latter, and it is high time that their value should be estimated, not by the pleasure enjoyed under such feelings, but by the benefits conferred through them. It is not enough to prove that the acquirement of knowledge (under existing circumstances) does no injury; it is not enough even to show how much amusement it may produce, though this may be called, to a certain extent, a benefit, perhaps a considerable one, as far as numbers go, considering how many are thus allured to take a casual glance at wisdom's charms, whom nothing else would allure; all this is not enough: there remain yet the minority—the starving few, to whom Wisdom's glance is life, whom Wisdom would gladly take in her arms as she flies, but who perish for want of strength to catch the border of her mantle. When you have shown me that the feebleness, the hopelessness, and the death of such poor starvelings, is owing to any thing but oppression, neglect, and partiality, I will acknowledge myself in error.

I certainly was not aware that mechanics had such a degrading opinion of Lord Brougham's sentiments and motives as is attributed to them. Strange that I should now hear of it for the first time! It appears in my poor judgment very like libelling my fellow-workmen with a character for ignorance, which I feel convinced is not their due. What! impute to the Chancellor a desire of keeping labouring men in ignorance of political knowledge; and this in the face of his declared opinion, and often recorded appeals to them, in favour of such pursuits! It is nearly as absurd as it would have been to attribute a contrary motive to his Lordship's predecessor; or to say that your flattering notice of cabinet-makers, Mr. Editor, was a libel on the Duke of Wellington.

That the exclusion of politics in Mechanics' Institutions should have prevented a more considerable number of mechanics from supporting them, appears to me rather doubtful. If they were the majority they would have had their remedy in their own hands—they could either have outvoted the minority, or formed a separate institution, which might have included political instruction among its benefits. But, in my opinion, the cause lies as much in the dispositions of mechanics themselves, as in the defects which exist in the constitution of these establishments. Some mechanics, who enter themselves on the books of these institutions, are like certain emigrants, who expect to get on in their adopted country without personal exertion, and finding themselves disappointed, leave it with greater distaste than they had before left their own. As to those mechanics who give themselves up to politics, they are in general inveterate debaters, and, of course, find no attraction in institutions where only one person is allowed to talk. Many mechanics cannot attend these institutions, all their leisure being occupied, either in their private studies, or in attending to their families; and, lastly, many more will not attend, nor would they, with their present feelings, under any circumstances. Knowledge will never be imparted to mechanics beneficially and generally, till it grows with their growth, till it is imbibed with their bodily nourishment, till it is carried to their homes, till it becomes a subject of feeling. This is no work of a day: the weeds that have flourished for ages, even till they have been mistaken for the tree of knowledge, will require a strong arm to root them up, aye, even against the wish of those who have flourished with them, as well as of those who have been stupified by them.

I was not understood when it was supposed I was describing a conceited smatterer in knowledge, whose airs would certainly deserve all the censure they might receive. I was thinking of a being who lived among his shopmates as if he was not *of* them, unnoticing and unnoticed, carrying his fancy's idol about with him, bearing no part in the idle feelings which stir up lighter minds, whose solitude was in the clamour of a workshop, to whom the poetry of life was eradicated, with its hills and dales, its gems and flowers, its sun-light and shade, its fears and hopes, and to whom remained only a region of stern and fixed thought, cold, calm, silent, living on its own brightness, like the gem in the "dark unfathomed caves of ocean," but imparting none. Where are this man's "airs?" It is not even known that he is more than an ordinary man. By the many he is even thought to be less—to have studied himself into a fool. Hence arises the "something worse than pity," the contempt, with which he is treated, and the bad opinion of his employers. Within a week after he has been discharged he is forgotten. Perhaps he may appear to forget as soon, for he is not one of your complainers.

I must beg excuse for my obstinacy, being unable to persuade myself that "a little knowledge will raise a person in his own estimation." I think it is more likely to lower him, and it will be found that no one can advance in true knowledge till he is thus lowered. This is no new doctrine: it is the basis upon which every true system of mental and moral education has been built from the remotest ages. Let the philosopher or the theologist vary its form as often as they would, the principle was still the same. It was manifest in the pithy laconism of Chilo, "Know thyself," and in the humiliating confession of Socrates, "I only know this, that I know nothing." It kindled the wish of Solomon's heart in the early dream of wisdom, when he said "I am but a little child; I know not how to go out or come in: give, therefore, thy

servant an understanding heart." And the founder of Christianity gave it utterance when he said, "He that shall humble himself shall be exalted." "Noble pride" and "self-respect" are terms that sound very well: they have a charm for our ears. Take away this charm—they only convey an encouragement to indolence, an excuse for error, or an apology for mischief. When a man advances in knowledge, he gradually retreats from himself, till at length he is lost in the infinity of wisdom, the object only of his study, not of his comprehension. If wisdom were any thing less than infinite, it would at once lose its value;—if it could be measured it would cease to be desirable. Though Pythagoras, Socrates, Copernicus, Bacon, made such giant progress, there was still a beyond, and will be after their fellows have appeared and passed away, even in our day, and in that of our descendants. How can he exalt himself who is travelling on an endless road, in which every step he takes carries him from self-thought? Pride and modesty are alike to him mere names of earthly feeling in which he bears no part, not because he is not liable to them, but because he has forgotten himself. He is out of the world; he has acquired a relish for separate, for hallowed pleasures. If, in the sharpened state of his intellectual appetite, he should be denied the means of satisfying it, and some touch of mortal feeling should steal into his heart and bring him back to manhood, it is too much to accuse him of "angry murmuring." Let me not, therefore, be thought to have made such an accusation. This man's state of mind is a thing so distinct from sordid feeling, that it would be the extreme of perverseness to give the one the name of the other.

I am glad that National Schools are admitted to be what they ought not to be: this is what I was endeavouring to prove, and it is some satisfaction to find such proof admitted. But then there are the *thoughts* of the poor, the beneficial, the self-satisfying, the fruitful thoughts that spring from poverty! Why deprive the poor of these? The thoughts that magnify the reality of wretchedness, that deepen its sighs, that feed its tears, that make covetousness no sin and theft no robbery, that fill our prisons with the children of virtue and place them before the children of vice to be tried: the thoughts that fancy a workhouse to be a charnel-house, and drive a man to starve in solitude; that place clouds before the brightness of the sun, and turn light and darkness into one long night: the thoughts that go to the very germs of affection, fraternal, filial, parental, conjugal, and all, and turn them into a quarry of flint. Aye, aye, poverty! as Mr. Potts truly observes, does make men think. "I thank thee, Jew, for teaching me that word:"—Poverty will *make* even the rich, the thoughtless rich, think; and 'twere worth while to try the experiment, merely for the sake of knowing what it is to think, only that such thoughts might perhaps never leave them till they brought them to an unpitied end and an unknown grave. But supposing one of them to be in such a case—and, indeed, it might so happen—would it not be well, while he yet had life, to visit his *ci-devant* rich acquaintance, and warn them that it was to their interest to attend with no niggard hand to the bodily and mental wants of the poor? Ah! no, they would not believe, though one rose from the dead. They have refused the goodly offer of receiving and conferring benefit with the same hand; they have neglected to do, while yet they might with a good grace have done, that deed of service: it may now be performed by a power beyond their control.

With respect to the hint about my signature, I have only to say I have not been in the habit of using a false one: I have no literary reputation to lose; and I know of no other earthly reason for pursuing such a course. My address was merely given for the information of the dome-gentleman.

I am sorry my style does not please—my "invidious sensibility"—my "cool anger"—my "vague" assumptions—my "elaborate, argumentative declamation." If my opportunities had been better, there would, perhaps, have been more reason in me: if I had drank at a purer fount I should very likely have yielded less poison. As it is, if I had the ability, I would gladly wield the ἀστραπὴ and the βροντὴ of Pericles and Demosthenes, in the hope of touching those hearts, by means of the most powerful and searching shocks of truth, which truth's reasoning would never nor ever will reach. I

am afraid I am too stiff-necked to be convinced by means of the logical style of your correspondent: he had better try his hand at declamation, and kill me with my own weapons. But it will be best to avoid personalities, as they are likely to be disagreeable both to ourselves and every body else. Talking about styles will do no good to any body, and it is best to try to do good, even if we fail. My ignorance and prejudice will certainly be unlikely to do much harm to others while they remain concealed, but it is worth while bringing them to the light, if it be only for the purpose of getting them removed. The truth which sparkles from the concussion of opposing prejudices will burn them out, and prevent their putrefaction from spreading.

Let me be allowed to say a little in favour of declamation, which it is so much the fashion to declaim against. There are two modes of reasoning, the true and the false—pure argument and sophism. By both modes the subject undergoes a most elaborate finish, and a nice adjustment of parts, so as to appear identical; but by one mode the most simple and solid materials are placed in the most natural and correct position; by the other, erroneous and distorted positions are chosen for the most complex and flimsy materials;—by each mode the subject requires to be taken to pieces to be examined. Those who use the former mode in its greatest perfection are mathematicians, and those who follow the latter with the greatest success are lawyers. Now let us examine the effects of both systems when applied. The mathematician has a most tender conscience: he is so afraid of error that he is startled at the appearance of truth itself, if it come too suddenly upon him; he labours so carefully and so tediously at his axioms, and makes so many excuses for his postulates and hypotheses, though no one questions them, that one half of his pupils are frightened away before he arrives at his first proposition. They think it incomprehensible that simple truths should require such careful proof, and believe the conclusion must be abstruse, when they find the premises so elaborate. The consequence is, the real lovers of mathematics are very few. The lawyer, on the other hand, is not troubled with a tender conscience. He would not give a fig to be retained on the side of truth: he courts error because it gives him a better opportunity for the display of his scientific acquirements. He abjures axioms, and goes at once to the *petitio principii*, running from thence, with practised rapidity, through the whole catalogue of sophisms, confounding at once both parties in the action. They are struck with especial wonder that truth should lose the day, and that error should have to pay for gaining it. The consequence is, that the real lovers of law are very few. The majority, then, delight neither in law nor mathematics: but they are great admirers of oratory. It would, therefore, appear that there is something in this, distinct from both extremes, but which may be made subservient to either pure argument or sophism. It is this that clothes truth with flowers, and places gems in her diadem—that softens her smile, and gives mildness to her looks—that makes her approach welcome and her rule easy: it is this, too, that gives her eyes their lightning, and arms her voice with thunder, that draws friends around her and places her foes beneath her feet. And though error may obtain a triumph by the same means, it shall not be eternal, and the cankerworm shall feed on her proudest joy. It is this spirit, whether acting on the side of truth or error, that gives life to our popular bodies: it is this magic that enchants our popular assemblies, that makes a multitude as one man, and thousands to hold breath and fix their eyes on one object, as if 'twere worthy of worship—to hang on words as if "excess of appetite grew by what it fed on"—that leads thought, and opinion, and judgment in its train, making a man give his gold, aye, and his very life, for a principle. Oh! take not away my love of truth, but give me, give me its power! Call it declamation, or what you will, but give me the power of truth! It is worth while to inquire how this power is obtained and exercised. Come, declaimer, (thou man of no repute in this dark age!)—come, let me examine you; not that I doubt your ability to defend yourself, but because you may, perhaps, not think it worth while. Did not your early wish to obtain the power you possess spring from a witness of the effects of a similar power in others; and was not your admiration of those effects

and of that power increased when you found they were exercised on the side of truth? Was not your wish, thus established, the guide and controller of all your thoughts and actions, and did you not set yourself apart as a devoted man? When you inquired into the extent of knowledge required for your object, and found it to comprise words and actions, thought and feeling, folly and wisdom, no trifle being too light, no learning too profound, did you not still admire, still devote yourself, determined to bring each thing and purpose, and all things and purposes, to bear on this one object? And although thus devoted, did you not appear to men as one of themselves; did you not sport with those who sported; did you not toil, did you not provoke, assuage, rule, submit; did you not analyse pride in its loftiness, and humility in its abasement, all affections morbid and valid, friendship in its zeal, and enmity in its bitterness? Did you not also go to your closet, make a companion of the midnight lamp, drudge at the mechanism of every science, and the tedious forms of every system, comparing appearances and surfaces, unfolding realities and mysteries, determining motions and essences? And did you not go to the wilderness to learn how it could be that artificial man should own Nature to be wonderful, and yet continually set her at nought; comparing man's works, wonderful, because produced by a being whom God made, with the works of God himself—wonderful too, because not meddled with by a created thing? And, lastly, did you not come with your mind thus prepared, your feelings thus attuned, your body also invigorated by temperance and exercise, your voice tempered to the sea's roar, so that you could set artificial man at nought—did you not come and deal forth the truth you had at command with a power that Truth herself alone could give you? Yes, I have seen that power thus exercised, and can testify of its effects. You have stood before the boisterous throng when a meaner voice, aye, or the winter storm, would scarce be heeded, and your very name has hushed the clamour; you have stood there, unmoved by the gaze of those thousand eyes, or aught else, save the intense feeling of your subject, and this indeed, though great your power over others, was manifest in all its workings. You have stood a moment in that unearthly silence—when expectation hung on your lip, you have stood like a being of another order. You have breathed forth your soul, you have raised your voice against that many-tongued multitude, you have opposed your opinions and feelings to theirs, you have persuaded, you have convinced, you have confounded, you have conquered, you have led captive; and of that vast multitude, not one but has joined the glorious shout to the triumph of truth. And is your work at an end? Has truth no farther triumphs to achieve? Do you not even now desire a subject that may task your abilities to the utmost? I will give you that subject. Stand now forth, raise your voice, gather your thoughts, bring all your knowledge; the subject is deep as infinity, boundless as wisdom itself. Rouse your keenest feelings: you need not fear exceeding limits. Nature has no modesty here: you will come home to all hearts, you will interest a man, a household, a tribe, a nation, the world, all ages. You have heretofore taken the cause of the poor against the rich, of the upright against the wrongdoer, of the oppressed against the oppressor: your cause is now that of all parties, of some in justice, of others in mercy to themselves. You have defended the doubtful claims of property, the title to which has been subscribed by the hand of man on perishable parchment; you are now to defend claims that are positive, inscribed by the finger of God, on the hearts of creatures of his own fashioning. You have pleaded for wants that something finite will satisfy, hunger, nakedness, homeless misery; your plea must now be extended—you must beg food for the soul, whose hunger has no limit, that she may be clothed with knowledge as with a garment, that she may find a rest for her weariness and a home for her desolation. And, lastly, you have advocated, and ably, gloriously too, liberty to persons, to actions; I call upon you now to advocate a loftier freedom—freedom to that unknown essence that is in our midst, yet not of earth; that that immortal thing shall no longer be cradled in chains, be nourished with poison, or starve in solitude; but when she leaves her palpable abode, to spring forth to the place of her nativity, that she may

not be without some traces of her Maker's glory—that she may not carry the marks of a fellow-creature's curse. Go, plead for an equal share of instruction to every child of man. Do this, and your name shall be written in the hearts of future generations of intelligent beings. Do this, and their living ancestors, who perhaps know not half the value of the gift, shall thank you.

But I am too warm, Mr. Editor—I am fond and foolish: though not old I am bitter.—Ah! when they taste the gall they will know its bitterness. I declaim too, and yet it is asked why there has not been a greater outcry against National Schools. That there has not, only goes to prove that parents have been successfully nurtured into a most enviable state of apathy. A well-educated person should not make nonsense of my words: the idea of placing his child in a National School might not be debasing to him who is already debased, but I question if a rich man would not think it debasing. I must confess my ignorance of the system of school-education among the rich: indeed, I hardly know how it could be otherwise; but if there exist great evils where there are great advantages, those evils must be multiplied where the advantages are few.

I trust your correspondent will be satisfied with the "proofs" you have brought, Mr. Editor, and I have to thank you for doing it more effectually than I could have ever hoped to do.

I am, Sir,
Your obedient servant,
SAM. DOWNING, Cabinet-maker.

NOTES WORTH NOTICE.

"A straw will show which way the wind blows; so may a passing paragraph sometimes point out the current of science, as well as a laboured detail.'

City Improvements.—The long-projected continuation of Farringdon-street to the Great North Road bids fair to be shortly effected, the Corporation of London having determined upon the line to be taken, and given notice of their intention to apply to Parliament next session for a bill to enable them to realise their plan. It is proposed to make way for the new road by demolishing a considerable part of the polite purlieus of Saffron-hill, so as to effect a junction with Coppice-row, Clerkenwell; then to keep on in that line for some distance, but to break out to the right near Bagnigge Wells, cross the Pentonville road to Rodney-street, and continue that street to the road in which the Caledonian Asylum is situated, which communicates directly with the main North and Holyhead road at Holloway. Minor improvements are also projected to the right and left, especially two branch carriage-ways,—from Hatton-garden to St. John-street, and from Hatton-wall to Clerkenwell-green,—each of which will root out an extensive rookery. The city always proceeds slowly; but it is hoped, on the present occasion, its march will, if slow, at any rate be 'sure.'*

French Magazine Literature.—The number of Parisian periodicals of every description (not political), daily, weekly, monthly, &c., is one hundred and twenty-six, of which the odd twenty-six are devoted to science and the useful arts, and one, Robertson's Magazine, is in the English language.

Sir Walter Scott's Successor.—The chair of the Royal Society of Edinburgh, vacant by the death of Sir Walter Scott, has been just filled up by the election of Sir Thomas Brisbane. Sir Thomas, who is a distinguished scientific character, succeeded General Macquarie as Governor of New South Wales, and, during his short administration, united philosophical research with the cares of government, and contributed to the British scientific Journals an extensive store of that information concerning the vast island of Australia, which his peculiar position placed within his reach.

Signs of the Time.—The worshipful Company of Clockmakers of London have set an example highly worthy of imitation, by collecting a library of books, chiefly on the subject of Horology, but including several on Mechanical Philosophy generally. We are not aware how admission is obtained; but, as the collection is said to be made for the benefit of amateurs as well as professors, we suppose the use of the library is not confined to members of the Company. In 1830, when the catalogue was made, the number of volumes amounted to between six and seven hundred, including a considerable quantity in the French language, which seems to be particularly rich in horological treatises; and also including, of

* Mr. Peter Jeffery (page 175.) misconceives the purport of a late 'note:' it was not said that the Corporation had determined to erect a new street from Moorgate to Lothbury, but that Mr. J.'s Arcade would stand in the way of any future plan to make such a street *to communicate with that* which "it is understood" the Corporation have determined upon, *from the Mansion-house to New London Bridge.*

course, a complete set of the Mechanics' Magazine, from its commencement. A Museum of curious pieces of chronometrical mechanism is also begun to be formed, and, although rather small at present, promises to become, in a course of years, very valuable and interesting.

New Scientific Association.—An Artists' and Amateurs' Conversazione, where the patrons and professors of the Fine Arts mingle together, and the latter exhibit their latest productions, has been in existence for a considerable period; and it is now proposed to establish a similar periodical meeting of the cultivators of the *Useful* arts. The Duke of Sussex has consented to patronise the plan, and the exhibition-room in Adelaide-street (that set on foot by the "friends of Mr. Perkins,") has been selected for the place of meeting. The promoters of the scheme anticipate great benefits to science from the mixing together of inventors and those qualified to advance their interests; but in this, it may be feared, their hopes are rather too sanguine. The worst feature of the whole is, that the former class, as well as the latter, will have to pay two guineas each, per annum, for the privilege of attending the Conversazione.

The Swan-River Settlement.—The first report of the "Western Australian Agricultural Society," at Swan River, has reached England. It gives a tolerably flattering picture of the progress of the infant colony, but admits that, in some points, its prosperity is not so brilliant as could be desired. Up to the date of the report, February, 1832, about 200 acres had been got under cultivation, and most of the soil was found to answer well for the usual agricultural productions of the mother country, 23 bushels of wheat having often been got from an acre. A weekly market had already been established at Perth, the capital, and it is said to be well supplied. Most of the colonists were looking with hope to the interior, and to other parts of the coast, where superior land is said to have been discovered: the natives were occasionally troublesome. Captain Stirling, the Governor, is coming to England, to solicit, we believe, further assistance from the home Government—a circumstance which does not augur well for the prospects of the new colony: it was certainly determined on with undue precipitation, and begun with a blind confidence which did not deserve success, even though it may (which seems doubtful) ultimately 'command' it.

An Enlightened Church.—It is gratifying to see that the system of illuminating church clocks is making some progress, although a *very* gradual one: in addition to the few already lighted, that of St. Andrew's, Holborn, has lately "caught the sacred flame;" and, from its commanding situation, displays the utility of the improvement in the most favourable *light*; yet, while these improvements are being made at the old churches, new ones are springing up on every side, destitute not only of a lighted clock, but of any clock at all! It is impossible to guess at the reason of this *untimely* deficiency, unless it be caused by a peddling spirit of economy, or rather niggardliness, *disgraceful to all concerned.* After all, a clock seems so appropriate an ornament for a church-tower, that, in many of these new buildings, the usual space is apparently left for his 'honest face,' but really filled up with some unmeaning plaster decoration, of no use whatever, except to entrap and disappoint the passing wayfarer.

The Great British Railway.—There is now every reason to believe that the London and Birmingham Railway Bill will pass the legislature in the course of the coming session, and that the projected plan for a railway-communication between Birmingham and the two northern hives of industry, Liverpool and Manchester, will also be shortly carried into effect. Proposals are also on foot for continuing the line through Carlisle, to Glasgow, with a branch to Newcastle; on the completion of which the metropolis would enjoy the facility of a rapid intercourse with all the great towns of the North. As either the Southampton or the Brighton railroad scheme may be expected to succeed, we shall only want our northern friends to extend the Glasgow railway to John o' Groat's, to have an iron-road from one extremity of the island to the other! Would not this afford a good opportunity of putting in practice some method for the instantaneous communication of intelligence by means of electricity?

CAPTAIN ROSS.

Sir,—A paragraph from the *Hampshire Telegraph*, stating that Captain Ross and his brave voyagers had been heard of, and that they were in safety, appeared lately in your Magazine. Such a statement is calculated to do injury to the subscription now raising towards the laudable object of fitting out an exploratory expedition to discover the fate of the gallant captain and his companions. The fact is quite the reverse of what was so prematurely reported. It is true a Captain Ross did at that time arrive at the port of Liver-

pool, from some trading voyage, and at Lloyds there was a report to the effect stated in the *Hampshire Advertiser*, but it was contradicted almost as soon as it got abroad.

Your obedient servant,
T. M. B.

ANSWERS TO INQUIRIES.

Patent Rights.—Mr. Baddeley requests an opinion on the following points:—"A takes out a patent for a certain invention in England, which he afterwards disposes of to B. Six years after, B takes out a similar patent for Ireland. The questions are, can B take out a patent for A's invention—and can he do so at any subsequent period of time; or is there any, and what limitation? Does not B's having publicly exhibited the invention, prior to taking out the patent, also interfere with its validity?" To the *first* question we give a decided negative. No patent for Ireland (or Scotland) can be valid for anything *previously* patented in England. When patents are desired for the three kingdoms, they must be taken out simultaneously; and it is this which causes the difference in the periods allowed for specification. When the patent is for England alone, it is usual to take two months only; when for England and Scotland, four; and when for England, Scotland, and Ireland, six. To the *second* question we answer that any public exhibition of an invention, prior to taking out a patent for it, unquestionably invalidates the patent. We refer to the first article of our present number for a case in point.

Painting on Parchment.—Mr. L. Mundy, who is in want of "a method of preventing the absorption of water colour, by the skins of parchment used for the purpose of leases, &c., when it is desired to annex the plans of the houses, &c. on the margin," is recommended to wash the parchment over with common size, and allow it to dry completely, before applying the colours. We have seen some plans laid down on parchment thus prepared, which are entirely free from the "sets" of which Mr. M. complains.

Purple Colour.—R. R. V. will obtain a very good purple for his show bottle by mixing a solution of nitrate of copper with ammonia, and adding a little water.

Castor Oil.—Sir,—If "Castor" (Mech. Mag. for October 20,) be not already in possession of the information he requires, I will forward him, gratuitously, a scarce tract, expressly treating on the subject of his inquiry, on transmitting his address, either per post, paid, or through the medium of your interesting Magazine.—I am, &c., William Dummett, Olveston, near Bristol, Dec. 10, 1832.

How to preserve Catgut Bands.—"Gulielmus," of Hereford, asks "what will prevent the catgut of a lathe being attacked by insects?" He states that his has been eaten through in three places, by a little white grub, and that he had thoughts of using alum, but is "fearful of soaking the gut in a watery infusion, lest he should injure it." Gulielmus's best remedy would be to use the catgut oftener; his next, to draw it through a handful of powdered rosin, the same as is used for the strings of violins. Any liquid application will be decidedly injurious.

Shear Steel was originally so called from its peculiar fitness for making shears; and is formed by welding several pieces of bar steel together. It is styled single shear, double shear, and half shear, according as the doubling and welding are more or less frequently repeated.

Mechanical Paradox.—The "Mineralogical Student" has lost his wager. It is quite true, as his "paradoxical friend" contended, that a triangular prism of iron may be made stronger by making it smaller; that is to say, where the force is to be applied to one of the sides of a prism, it becomes stronger by having the opposite angle cut away. The fact was first noticed (we believe) by Emerson, and has been since repeatedly confirmed by experiment.

INQUIRIES.

Sir,—I have often admired the taste displayed by the French in the vases, cups, &c., used for flowers on the balconies, parapets, &c. of their premises—which are made of cast iron, and painted in imitation of stone or marble; they may readily be purchased in Paris at from a franc (10*d.*) to a louis d'or (£1), at any of the iron warehouses on the quays, of every variety of pattern. Being anxious to introduce them in my own garden, I have applied to some of the iron founders in this district, but cannot persuade any of them to attempt casting them from plaster models. I shall feel obliged if any of your numerous correspondents would state if they are to be procured in England, as I am sure they would meet with a ready sale, if made *light*, and the price moderate; and surely we ought to excel the French in works of iron, whether useful or ornamental. The designs you have introduced in your Magazine of July 28, 1832, are similar to what I have noticed, but the danger of stone-ware easily breaking from accident, or bursting if used for plants in a severe frost, independent of the greater expense of stone-ware, would, I think, preponderate in favour of iron.—I remain, Sir, yours obediently, T. W., Ripon.

Sir,—I beg leave to apply to your correspondents, through your useful miscellany, for instructions how to make a trap that will catch birds without injuring them. I have been told that there is a trap called a Nightingale trap, which opens or spreads on the two sides, similar to a rat-trap, and that a net is attached to each side of the trap, which closes over the bird when the bait is touched. Any information on this subject will oblige, A Sportsman, Salop, October 30, 1832.

Sir,—Will you favour one, who has received much instruction from your weekly publication, by permitting him to ask of your correspondents,—1. By what process *spirits of wine* may be made to unite with the *glaire of eggs*, without *curds* being formed, which has hitherto happened whenever I have attempted their combination.—2. By what means *spirit of turpentine* may be made to mix *intimately* with *white vinegar*.—Your obliged servant, "E."

MISCELLANEOUS.

Water in Mines.—The quantity of water which miners have to contend with, is generally very great. In some of the collieries on the Tyne, they have to raise eighteen times the quantity of water which they do of coal.

The Rhine and Weser.—Considerable progress has been made in forming a company in Westphalia for the important purpose of connecting these two streams, by means of a railway, from the shore opposite Cologne to Minden. The distance between the two places is about one hundred and sixty miles, which may be performed by steam conveyance in one day; whereas the present means of transport consume between six and seven. We understand that the city of Bremen, which is essentially interested in bringing the plan to bear, has offered to contribute £150,000 out of the £375,000 which its completion will require.—*Athenæum.*

Clodpoles.—The agricultural counties of Hertford, Essex, Norfolk, and Suffolk, are stated by phrenologists to contain a larger portion of small heads than

any other part of the empire. The average size of the male head in England, when in a state of maturity, is 7 inches; but in the counties named it rarely exceeds 6½ inches.

Hatching Eggs.—A new mode of artificial incubation is stated to have lately been practised with success in the south of France. The eggs are put into a basket, and suspended in a stove, placed in the midst of a hot mineral spring. All the care required is to turn the eggs once a day. *Query*—Would not any other water, kept at a moderate heat, answer equally well?

Locomotion without Steam.—On the 23d of last month, Mr. Hoffman, an engineer of Dantzic, made a first experiment with his newly invented machinery, for driving paddle wheels without the application of steam. Several friends accompanied him in his trip, which his little vessel performed to admiration, though at a somewhat slow rate. We are told that the mechanism by which the wheels are impelled, derives its power from quicksilver instead of steam.—*Morning Herald.*

Ogle's Steam Carriage.—On Saturday morning last, Mr. N. Ogle, accompanied by Mr. Babbage, Mr. C. Bishcoff, and several other gentlemen, proceeded from the Bazaar, in Portman-street, to the residence of Mr. Rothschild on Stamford-hill. The distance of seven miles was accomplished, notwithstanding the crowded state of the roads, in 31 minutes.—*True Sun.*

The Tides.—Among the singular occurrences with regard to the tides at and near London, is this, that after the flow has apparently reached its maximum, the tide seems to ebb for awhile, and then return again after an interval of thirty or forty minutes. An incautious observer may mistake as to which of these is the real high tide.—*Englishman's Almanac.*

NEW PATENTS GRANTED BETWEEN THE 20TH OF NOVEMBER AND THE 22D OF DECEMBER, 1832.

Thomas Todd, of Kingston-upon-Hull, shipping-agent, for certain improvements in machinery or apparatus for raising water and other liquids. To inrol within Six Months from the 24th November.

George Rudall and John Mitchell Rose, both of the Piazza, Covent Garden, flute-manufacturers and copartners, for certain improvements on or in the construction of flutes. Six Months; Nov. 27.

Thomas Howard, of Copthall-court, late of New Broad-street, in the city of London, merchant, for improvements on his invention denominated the Vapour-Engine, and the application of a part or parts thereof, with certain additions or improvements, to steam-engines. Six Months; Nov. 29.

Robert Cattle, of Grove House, in the county of York, Esq., and William Greaves North, of the city of York, gent., for an improvement in the construction of fire-engines. Six Months; Dec. 4.

William Ranger, of Brighton, builder, for a cement or composition which he denominates Ranger's Artificial Stone. Six Months; Dec. 4.

Julien Frederic Maillard Dumeste, of No. 33, Paris-street, Lambeth, county of Surrey, Professor of Chemistry, for his invention of a machine to reduce caoutchouc, or Indian-rubber, into elastic thread, calibered of different sizes. Two Months; Dec. 7.

John Hornby Maw, of Aldermanbury, London, surgical-instrument maker, for certain improvements in the form and arrangement of parts of an apparatus for injecting enemata. Six Months; Dec. 17.

Joseph Hardwick, of Liverpool, gent., for certain improvements in paddle-wheels. Six Months; Dec. 17.

George Frederick Muntz, of Birmingham, metal roller, for an improved manufacture of bolts and other the like ships' fastenings. Six Months; Dec. 17.

John Langham, of Leicester, bobbin-net lace-manufacturer, for improvements in machinery for manufacturing bobbin-net lace. Six Months.

William Crofts, late of Lenton, but now of Radford, county of Nottingham, framesmith, for certain improvements in machinery for making lace or net, commonly called bobbin-net lace. Six Months; Dec. 18.

Thomas Alcock, of Claines, county of Worcester, lace-manufacturer, for certain improvements in certain machinery for manufacturing bobbin-net lace. To inrol within Six Months, and to extend to the colonies, &c.

Thomas Alcock, of Claines, county of Worcester, lace-manufacturer, for certain improvements in certain machinery for manufacturing bobbin-net lace. To inrol within Six Months, and to extend to the colonies, &c.; Dec. 8.

Mem.—Although these two last-mentioned patents bear date the 8th, they were not sealed till the 18th, in consequence of a caveat being lodged against them, and the matter coming before the Court.

Thomas Parsons, the younger, of Furnival's Inn, gentleman, for certain improvements on locks for doors and other purposes. Six Months; Dec. 20.

Joseph Saxton, of Sussex-street, county of Middlesex, mechanician, for his invention in propelling carriages, and in propelling vessels for inland navigation. Six Months; Dec. 20.

Robert Selby, of Burleigh-street, Strand, county of Middlesex, wine-merchant, for certain improvements in the making or constructing of bedsteads, sofas, couches, and other articles for ease or repose. Six Months; Dec. 20.

William Gutteridge, of the Minories, civil engineer, and George Stevens, of Norwood, county of Surrey, sugar-refiner, for an apparatus for the manufacture and refining of sugar and other extracts, and applicable also to other purposes. Six Months; Dec. 21.

INTERIM NOTICES.

☞ *The office of the Mechanics' Magazine will be removed, on the 18th of January next, to Peterborough Court (close adjoining), where all communications, after that date, are requested to be addressed.*

Ours is not a Magazine of rhymes: we hope therefore "Jib" will not take it so seriously to heart as he threatens to do, that we feel obliged to decline his "First Offering."

We do wish "to encourage rising genius," but none of the questions sent to us by Mr. J. S.'s pupils possessed either originality or importance enough to induce us to submit them to our readers.

We should probably have no objection to insert H. S.'s inquiry, if we could manage to decipher it; but this we have tried in vain.

Communications received from Mr. Lyon—Mr. Cary—A Constant Reader—E. S. L.—Mr. Aubé—Quivis—S. T. P——s—Junius Redivivus—Mr. Rough.

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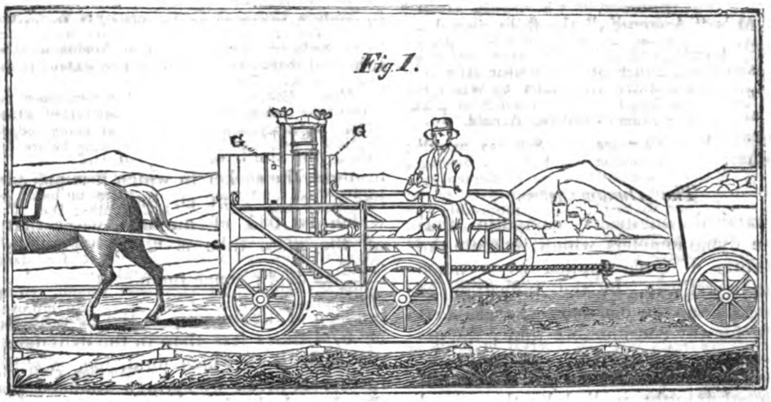
MILNE'S MERCURIAL DYNAMOMETER, AND RAILWAY LOCK.



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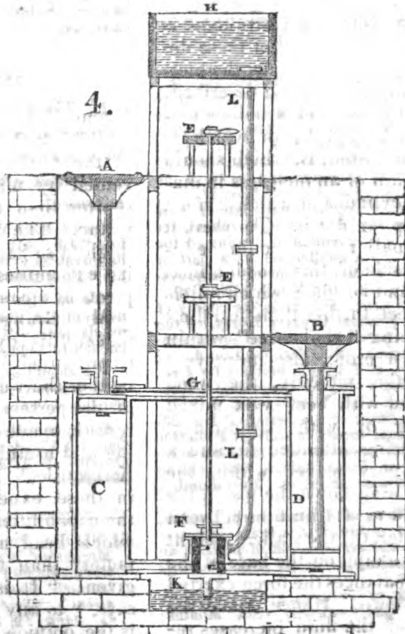

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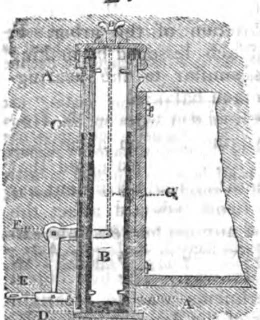

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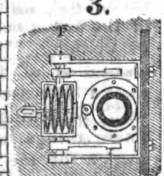

MILNE'S MERCURIAL DYNAMOMETER, AND RAILWAY LOCK FOR RAISING CARRIAGES FROM ONE LEVEL TO ANOTHER.

In our review of Mr. Milne's excellent "Practical View of the Steam-Engine" we made mention of a mercurial dynamometer, for which Mr. M. had received the honorary gold medal of the Highland Society of Scotland. We now proceed to fulfil our promise of extracting from Mr. M.'s "Appendix" the following descriptive particulars of this instrument; and shall subjoin thereto an account of an ingenious apparatus which Mr. M. has also devised for raising or lowering railway carriages from one level to another.

The Dynamometer.

Practical engineers complain that those dynamometers which indicate the quantum of force applied by a horse upon a railway, by the inflection of springs, lose their elasticity when kept at work for any considerable time; the oscillations of the index-pointer, too, make it impossible to ascertain the medium of unequal draught applied by the animal in stepping out. Such also is the case when any other common instrument is used for this purpose. Both of these defects are completely obviated by the mercurial dynamometer now to be described. This instrument consists of a hollow metallic cylinder A, fig. 2, in which is placed a floating piston, B, which should be about one-tenth of an inch less in diameter than the cylinder in which it must move freely up or down. To prevent friction, four small rollers should be inserted into the side of this wooden float both at its top and bottom; which rollers should not project further than to admit of the piston being "shake-free" within its cylinder. In order, also, to prevent absorption of the mercury, the wood should be coated with bees' wax mixed with whitening or with lamp-black. These things being attended to, and a portion of mercury placed within the cylinder, by pushing down the piston the fluid will ascend in a thin film between it and the cylinder, till the statical weight of the mercury, acting on the base of the floating piston, balances the force exerted in pushing it down. Hence, since the statical weight of the fluid increases reciprocally as the height to which it is caused to ascend by its displacing force, so must its various points of height within the cylinder be a measure of the force in equilibrio with the statical weight of the fluid.

Such being the construction of this dynamometer, it is only necessary to fix it in a vertical position to the front of the foremost of a train of waggons, and to turn the direction of the horses' draught in such a manner as to cause it to pull down the floating piston; while a glass tube exhibits the height of the fluid, and consequently the force exerted by the animal. To prevent any sudden elevations or depressions in the mercury in the tube, from the irregularity of the horses' draught, the socket in which it is placed has a ventricle at D, the diameter of which is ·033 of an inch, while that of the glass tube is ·250; wherefore $\frac{\cdot 250^2}{\cdot 033^2} = 57{\cdot}4$; hence the elevation or depression of the mercury in the tube must be 57·4 times less than in the cylinder; the celerity of which fluid, too, is still further reduced by springs attached to the draught-hook, as seen in the plan, fig. 3. Since this machine was first constructed it has occurred to Mr. Milne that by attaching a stop-cock the celerity of the motion of the mercury in the glass tube could be regulated to any required extent with the utmost exactness. In addition to these contrivances, oscillations of the fluid might be still further prevented by making the yoke-levers, E, shorter than those which pull down the piston. The friction of the arbor, F, might also be much lessened by making its extremities similar to the bearing-pivots of a common balance.

Mr. Granger, the engineer, having placed this dynamometer on a carriage (represented in fig. 1) so constructed that neither the weight of the instrument nor of the persons upon it should affect the results, made a number of very interesting and useful experiments with it on the Kirkintilloch Railway. The first object in these experiments was to ascertain the capabilities of the dynamometer; on which head nothing can be more satisfactory than the testimony Mr. G. has given. "It is altogether superior," he says, "to any other I have seen; and it is the opinion of several engineers who have seen it at work that it is the best

instrument for engineering purposes that has ever been tried. A long and circumstantial narrative of these experiments is given, but it is only necessary that we should here place before our readers the principal facts which they have established with respect to friction on railways:—

1. The medium friction of a train of five waggons on a level part of the railway was 9lbs. per ton; while on a curved part, with a radius of about 800 feet, it was 18lbs. per ton.

2. A draught of 10·8lbs. per ton was required to travel at the rate of three miles an hour when the rails were dry, and only 6·8lbs. when wet.

3. On a level the force exerted by horse was observed to vary from 90 to 110lbs., but when the train came to a part of the railway which inclined at the rate of 1 in 280, the waggons descended freely by their own gravity.

4. On a descent of 1 in 117, a waggon with wheels 2·5 feet in diameter carried 1020lbs. more weight than one with 3-feet wheels, at the same rate of speed and with the same power applied; but on a curve with a radius of 1000 feet the 3-feet wheels proved superior to the 2·5—a circumstance which Mr. Mylne ascribes to the axles of the 3-feet wheels being of two pieces, meeting within a bush at the centre, while the 2·5 wheels were attached by an inflexible axle, whence it followed, in the case of the former, that "all the wheels would roll upon the rails of different radii, independent of the motions of each other."

5. The average force of draught required on a level at 3·5 miles per hour was 8lbs. per ton; at 6·66 miles, 9·5lbs.; at 7·5 miles, 10·2lbs.; at 8 miles, 10·67lbs.; at 8·57 miles, 11·63lbs.

The Railway Lock.

Let A and B, fig. 4, be two platforms, on which the waggons are to be elevated or let down; A being at the upper level and B at the lower. C and D are two cast-iron cylinders, filled with water, and having water-tight pistons supporting the platforms, A and B. Suppose, now, that a train of waggons has been placed on the platform, B, to be raised to the upper level, and that a greater weight is about to descend upon A; then by turning the handle, E, of the fourway-valve, F, to a proper point on an index beneath it, the superior weight on A will press the water below its piston through the valve F into D, and thereby elevate the weight upon B; the fluid above the piston in D passing over into C by the pipe G. But suppose there is no counterweight ready to descend on A when it is required to raise a load on B, then by turning the handle E, the water in the cistern H will descend and press up the piston D, while simultaneously the water above D will pass off through the pipe G into C, and the water below the piston in C will make its exit through one of the waterways of the valve F. Or if, on the other hand, there should be a load descending on A when there is none ascending on B, the valve F has only to be turned in proportion to the load (a matter which practice would easily determine), when a corresponding weight of water will be driven from the cylinders up the pipe and into the cistern H; in which case, the cylinders below the ascending platform will fill themselves from the well K. The power of a machine of this kind may be stated as being equal to the weight of a column of water whose base is equal to the height of the fluid in the pipe L; and were this pipe a transparent tube, with a graduated scale attached to it, the height of the fluid in the tube would clearly point out the quantity of weight incumbent on one or other of the platforms, minus the friction of the pistons.

ON RECLAIMING LAND FROM RIVERS.

It is with nations as with individuals—if animated with industry, every function is healthy and fulfils its office; but when employment ceases or diminishes the frame is paralysed, and falls into a state of debility or decay. Employment is prosperity. Assuming this as an acknowledged axiom, it is of the last importance that we should ascertain what available means we have of employing our national industry with advantage to individuals and the public. That there is a mass of unemployed labour is proved by the multitude of paupers; and the cry is urgent that these, instead of eating the parish bread in idleness, should make their own hands minister to their wants. There is no measure that presents itself to my mind so calculated to effect this object—to extirpate the evils of pauperism—as the reclaiming land from our rivers, by means of a judicious system of weiring,

combined with the Colmata of Torricelli. Impressed with the importance of this procedure, I have employed some leisure in the consideration of the subject, and I shall be amply repaid if even one of the ensuing suggestions shall be found not wholly useless to the public.

Persons accustomed to admire the curvilinear form of rivers may never, perhaps, have inquired into the cause of it, and still less anticipated that those graceful but barren sinuosities on which the eye reposes with delight, can, by the aid of man, be converted into fruitful fields. One principle cause of many of these bends or bites will be found in the mutual action of the river and its tributary streams. The water of the river is drawn up the tributary, the mouth of which is gradually eaten away or abraded by this diversion, and by the force of the stream as it returns to the river. If we allow sufficient time for abrasion, this will alone account for many river-bites. Rivers, however, are sometimes deflected from their course by barriers of hard rock, and though angles may be observed for a while, yet the action of water soon gives to them a curvilinear form. The water in a bite being kept up, and comparatively calm, is enabled to purge itself of a considerable quantity of the detritus collected by the tributaries in their course from the high lands. Those who have not had the opportunity of observing the growth of banks will hardly be able to form an adequate conception of the vast quantities of matter carried down by streams and rivers. The elevated parts of the earth are ever changing—so much so, indeed, that the earth, rather than the ocean, is a fit image of mutability. Mountains being subjected to continued weathering are at last denuded of their vegetable and earthy covering, and assume that acuminated or peak-like form so commonly observed in Alpine countries.

The design of the Colmata is to gain land and means of irrigation. With a view to irrigation barriers or weirs sufficiently high should be thrown across the river, so that the water may be kept up to the desired elevation. The Po is so much raised by this means as to be of the nature of an aqueduct carried above the adjoining lands. At Ferrara, as I have been informed, it is higher than some of the houses in that city.* It will, of course, be necessary to embank the river above the weirs; but if the fall is inconsiderable, and there are several tributaries, many large beds of sand will be found at low water along the shore, and under these circumstances a preparatory mode of procedure should be adopted. In the first place, common weirs should be made to jut out into the river at proper intervals, and if judiciously placed, much land may be gained by this simple measure.

In the Dee, at Chester, a different mode of weiring has been pursued. There, a weir is directed down the river, and when the portion of land to be gained from the water has been sufficiently raised by repeated deposition of sediment, a cross-weir is thrown out from the shore so as to connect with the main or running weir. This last is then lengthened, and the procedure before described is repeated. It has been observed that banks whose base is to their height as four to three, stand very well in most soils, and this is a shape very usually given.† In the course of these processes it will be found greatly to accelerate the gaining of the land if it is planted with quitch grass, or, as it is commonly called, wicks. This grass is of very rapid growth, and runs along the surface, throwing out a multitude of roots which bind together the particles of matter in a firm mass. In suggesting the use of quitch grass (which is well known to be a very noxious weed), it will, of course, be understood that I do not speak of it as fitted to constitute the ultimate herbage. When the land has been completely gained it should be sown with proper grasses.‡ Besides taking the precautionary step here pointed out, it is desirable that the land-water should not be allowed to cut channels for itself; but, on the contrary, proper channels of discharge should be formed so as to carry away the water into the river with the least possible erosion of the land.

If there are any side streams or tribu-

* See also De la Beche's Geological Manual, 62, and Lyell's Principles of Geology, Vol. i. pp. 183, 184.

† Encyclopædia Britannica, Art. River.

‡ On the subject of grasses, see results of the experiments instituted by the Duke of Bedford, and stated in the Appendix to Sir H. Davy's Lectures on Agricultural Chemistry.

taries, these should be withdrawn from the bends or bites in which they are commonly found, and brought forward to the bows and there issued through masonry, care always being taken that the openings are above and not below the neighbouring weir. It is likewise important to observe that the outlets of tributaries should not be opposed to each other, because where currents meet, sediment subsides, and the side-streams flowing from opposite openings cut channels for their respective courses, and in time an island or a bank will be formed in the middle of the river. The Holm Sand, near Lowestoff, is a well known instance of this,* and other illustrations will easily occur to those conversant with rivers. If the new openings of the tributaries are made to draw the river, the streams as they flow back may be so directed by alternate side walls, that the course of the river will be straightened and its bed narrowed; for the areas of the bites from whence the tributaries were diverted, receiving continual deposits, may at length be enclosed and cultivated. This object, however, cannot always be attained so easily, unless by aid of the Colmata, and the procedure just described must in many cases be considered as only preparatory to Torricelli's plan. When the water is kept up by the cross-weir before mentioned, it may be easily used for irrigating the neighbouring lands, and will be equally available for the Colmata. The area intended to be gained must be enclosed with a bank, and into this enclosure the water from above must be admitted, and detained until it has purged itself of all sedimentary matter; the purified water must then be discharged through a sluice. If this process be repeated several times, the successive deposits will gradually raise the bed, so that in the end it cannot be overflowed by the river.†

A process somewhat similar to the Colmata, and called "warping," has been successfully used in the estuary of the Humber. The tidal-water is introduced artificially into lands below the level of the sea; and so vast is the quantity of sedimentary matter suspended in the water, that by this operation being repeated for two or three years together, considerable tracts have been raised to the height of about six feet.*

I cannot conclude this part of the subject without noticing two ingenious processes for deepening rivers, one of which has been employed in America, and the other is the happy invention of Mr. Affleck, of Dumfries, and is likely to form a new epoch in inland navigation. The former is used for wearing away rocks; the latter for cutting through sandbanks.

With the view of wearing away rock, a boat, says Mr Babbage, is placed at the bottom of the rapid, and kept in its position by a long rope, which is firmly fixed in the bank of the river near the top. "An axis, having a wheel similar to the paddle-wheel of a steam-boat fixed at each end of it, is placed across the boat, so that the two wheels and their connecting axis shall revolve rapidly, being driven by the force of the passing current. Let us imagine several beams of wood, shod with pointed iron, fixed at the ends of strong levers, projecting beyond the bow of the boat. If these levers are at liberty to move up and down, and if one or more projecting pieces, called cams, are fixed on the axis opposite to the end of each lever, the action of the stream upon the wheels will keep up a perpetual succession of blows. The sharp-pointed shoe striking upon the rock at the bottom will continually detach small pieces, which the stream will immediately carry off. Thus, by the mere action of the river itself, a constant and most effectual system of pounding the rock at its bottom is established. A single workman may, by the aid of a rudder, direct the boat to any required part of the stream; and when it is necessary to move up the rapid, as the channel is cut, he can easily cause the boat to advance by means of a capstan."†

Mr. Affleck's plan of cutting a channel through sandbanks is characterised by great simplicity, and affords another instance of the means by which Nature

* Lyell's Geology, Vol. i. p. 272.

† For a particular account of the Colmata, see Appendix. The process here described might be denominated "The Heaper;" but this name has already been appropriated to that useful machine which is used by the cultivator of moss-land for at once cutting and heaping up the ear or moss with a view to its being burnt. The ashes, when mixed with the clay that is thrown out of the drains, form an excellent compost.

* Lyell's Principles of Geology, vol. i. p. 307.

† Babbage's Economy of Manufactures, pp. 38, 34.

may be made to correct herself. Mr. Affleck informed me that he had long attentively observed the action of water, and that after some years of patient study it occurred to him that the same power which formed a sandbank might be so regulated that it would remove it. The procedure consists in placing along the proposed channel, in direct and transverse lines, strong planks of wood, and fixing them down by long bolts of iron. The tidal and freshwater currents dashing against the bolted planks, are thrown into a great tumult; and the water seeking for itself a vent, scoops out a passage under the planks, tearing away the sand with violence. The planks are then knocked down to the surface of the sand, and this operation is repeated until the necessary depth of channel has been cut. Besides this process, a machine, founded on the same principle, is used by Mr. Affleck, and acts, I believe, with greater efficacy than the bolted-plank system, but I have not had an opportunity of observing it in action.

It will occur to the reader that Britain, being a long island, intersected with high ridges of rock from whence numerous rivers take their rise, is advantageously formed for the purposes of the Colmata; and even a hasty survey will show what immense tracts of land may be gained by pursuing the suggested plan.

That the acquisitions thus made would be most important to the enlightened individuals who should have the spirit to enter upon the undertaking, will hardly admit of any doubt; and when we reflect what multitudes of men would thus be enabled by their daily labour to earn their daily bread, the advantages to the public must needs be great. It is obvious that labour would constitute the chief element of expense, and to find employment for industry is, in this country, the one thing needful.

It has been suggested that the present system of secondary punishments should be wholly abandoned and some other substituted, for the existing one is the worst imaginable. And with this view, Archbishop Whately, in his judicious 'Thoughts on Secondary Punishments,' has alluded to an experiment begun on a small scale on the Sussex coast. It has been found that the sterile beach abandoned by the sea in the neighbourhood of Pevensey, may be rendered fertile by the shingle being covered over to the depth of a few inches with a good soil, which abounds in the immediate neighbourhood. "Although," observes Dr. Whateley, "it may be doubtful whether this undertaking will in any case answer, *i. e*, more than replace the expense of maintaining the labourers, especially when these are convicts, it must, at least, repay a *part* of the expense, and every acre of land thus brought into a productive state by the labour of those who, whether employed or unemployed, must have been maintained at the public expense, may be regarded as so much clear gain to the community."* But, in my opinion, a much wider field of employment, and one far better calculated for the purpose, would be found if the suggestions here offered were systematically pursued. Unfortunately, however, there are so many prejudices to overcome, so many real or imaginary wants to satisfy before any plan of the kind suggested can be undertaken on a comprehensive scale, that we should be more sanguine than reasonable if we expected that even the best possible scheme would be at once adopted.

Not the least of the advantages consequent on the application of the Colmata would be, that vast quantities of water, besides being at hand for irrigation, might be used for working machinery; and though the time may never come when our coal-fields shall be exhausted,† yet

* Thoughts on Secondary Punishments, 42.

† *On the English and South Welsh Coal-fields.*—It is hardly possible to approximate to any thing like accuracy in any calculation as to the time that must elapse before our coal-measures shall be exhausted; still calculations have been made, and it may not be uninteresting to subjoin a note on the subject. Mr. Taylor, the Duke of Northumberland's agent, has spoken of the probability of the coal of Northumberland and Durham lasting 1700 years; but this calculation Professor Sedgwick considers to be greatly overrated, and in this view he is supported by Dr. Buckland. These eminent geologists concur in fixing upon 400 years as the more probable term. This need not, however, excite our apprehensions, for, according to the calculation of Mr. Bakewell (see his Introduction to Geology), the South Welsh coal-field will supply England with fuel for 2000 years after all our English coal-mines are worked out. Still it becomes a duty, which we owe to posterity to enforce, if possible, an economical use of coal. The system of manufacturing coal for the market by the process called skreening, together with the impolitic regulations of what is termed the vend, will, I trust, be wholly abandoned now that coal is sold by weight, and not by measure as heretofore.

It is gratifying to add that Sir H. Davy's safety-lamp has not only saved the lives of hundreds of his fellow-creatures, but likewise enabled proprie-

such is the increased supply of fuel demanded, and likely to be demanded, by locomotive engines and in steam navigation, &c., that we must anticipate an advance in the price of coal, and if so, the power derived from water will increase in value. Besides, the water being kept up in the manner before mentioned, there would be increased facilities for water carriage, for with the aid of locks, rivers might be rendered navigable far into the interior.

The timber of our woods, and the valuable productions of our mines and quarries, would be acquired with less labour, and with less outlay of capital; and the costs of the raw material being thus diminished, the various forms that it assumes in the hands of the artist would then be had at a reduced price, and this reduction, creating a greater demand, would increase the supply.

As one of the consequences resulting from the application of the Colmata, I have alluded to the facility which would be afforded to irrigation. The importance of irrigation, although it has been duly appreciated by many agriculturists in the south of England, yet it has not attracted generally so much attention as might have been expected. In Italy this subject has been systematically studied, and the magnificent works subservient to the purpose of irrigation have justly excited admiration. So valuable is water considered, that rents are frequently paid for supplies from canals of irrigation.* Simonde, in his *Tableau de l' Agriculture*, has given us a particular account of the Tuscan mode of irrigation, and the whole volume is deserving of perusal.

The importance of irrigation will, perhaps, be set in a more striking light to those who are not practically conversant with the subject, if I mention that some water meadow-land, with which I am acquainted, lets higher by half than the neighbouring land, of equally good soil, which is not irrigated, although on an average nearly every third crop is spoiled. The herbage is extremely thick and succulent, and affords so much nutriment that it is eagerly bought up for coach horses, and, as I am informed, it is not a bad substitute for corn. It may be useful to observe that grass, which is very succulent, is apt to be (what is technically termed) mow-burnt; but this may be wholly or in a great measure prevented if a funnel is formed in the middle of the rick or stack. This is done by making a sack of straw the nucleus of the rick, and when the stacking is completed it is drawn out.

The nature of this essay forbids me to enter into minute details on the subject of irrigation; but it will not be irrelevant to observe (and existing circumstances may justify the digression) that the greatest care should be taken that there is little or no stagnation of water. It has been shown by Dr. Harrison, in his "Inquiry into the Rot in Sheep and other Animals," that this disease is extremely analogous to many disorders in the human constitution; and it seems not improbable that the rot and cholera morbus are effects of the same cause, i.e. of poisonous effluvia, which, under certain circumstances, are evolved from moist or marshy soils.*

The principal object which I have had in mind in suggesting the application of the Colmata to English rivers, is the employment of the poor, and I have endeavoured to show that, besides this important consequence, it deserves the attention of individuals in a mere pecuniary point of view.

In connexion with the subject of this

tors to work not only whole collieries, but considerable *tracts* of collieries which had been abandoned. Mr. Buddle observes, that almost all the collieries below the bridge on the Tyne would have been extinct in 1830, but for the safety-lamp; in fact, it has made a renovation of those mines. He adds, that it is not difficult to persuade the men to use a Davy, but they are apt to take the cover off. It is usual, however, to lock those Davy's which are in the hands of boys, or which are used in dangerous places.—See the Report of the Select Committee on the State of the Coal Trade. According to Mr. Brande's calculation (Outlines of Geology, 100,) ⅛ part of every chaldron of coals consumed in our ordinary fires is lost in the form of soot, smoke, and other unburnt matters. There is little doubt that a more economical mode of burning coal might be discovered.

It seems that the City of London is entitled to 4*d*. per chaldron on all coals measured, or 8*s*. per ton on coal weighed in the Port of London. After certain small payments, these charges produce a surplus fund of £16,000 a-year, which is applied to the general purposes of the Corporation. Is not this Corporation-tax most impolitic?

* See Sir John Sinclair's Essay, 387.

* "I have had occasion to observe," says Dr. Harrison, "that miasmata are produced in some way or other by the sun's action upon moist ground, and, therefore, when it is well covered with grass early in spring, we have less danger to apprehend, provided we maintain a deep herbage till the commencement of frosty weather."—Inquiry into the Rot in Sheep and other Animals, pp. 33, 34. 1804.

Essay, and as supplementary to what has been already said, I shall offer a few remarks on an opinion too commonly entertained, that the more the price of labour is reduced, the more advantageous it is to the employer. That such a fallacy should obtain may astonish as much as its evil consequences may excite regret. A just exposition of the case will be its best exposure. For instance, it is conceived that if a proprietor reduces the wages of his labourers, so far forth such reduction he is a gainer—that if he pays 1*s*. 6*d*. instead of 2*s*. 6*d*. a day, he saves 1*s*. If, however, we recollect that the wages of labour are not hoarded up, but laid out in the purchase of the necessaries of life, that is, in milk, bread, butter, potatoes, &c., it requires no reach of thought to understand that the farmer will suffer by this reduction of wages. The earnings of the labourer being less, he cannot lay out so much as before in the purchase of agricultural produce, and this causes a fall in the price of corn, butter, &c. But if the farmer cannot get so much for these commodities, neither will he be able to pay the same rent to his landlord, the proprietor. Besides it is physically impossible for a labourer ill-fed to do as much work as one who is well-fed. Nor will he, conscious that his employer robs him of the comforts, and intrenches on the necessaries of life, be careful about his master's interests. Instead of working with good will, his service will be mere eye-service. Besides if the earnings of the labourer are insufficient to purchase the necessaries of life, he and his family must be maintained by the parish, that is, out of that fund which is raised from the land. If we add the demoralising effect of thus aggravating the miseries of the poor, and of thus degrading them from the rank of manly independence, enough is before us to show the folly and wickedness of such procedure.

M.

Lincoln's Inn, Nov. 6, 1832.

APPENDIX.

*Les Comblées, or Colmata.**

(Translation.)

Arthur Young, in his 'Travels in Italy, mentions incidentally the Colmata, or Comblées, the only expedient known in that country for restoring fertility to lands rendered marshy by floods; but supposing, doubtless, that the procedure could be of no use to English agriculture, he bestowed on this subject but little attention, and the account which he has given of it is absolutely erroneous. The Colmata, however, promises advantages to agriculture of almost unrivalled grandeur and importance.

The violent rains of Italy, acting on the schistus of the Appenines, carry down a vast quantity of rich mud into the plain, by which the courses of the rivers are frequently obstructed. These rivers, which appear ordinarily like so many threads of water lost amidst plains of gravel, are swollen by the rains into immense turbid streams, which quickly cover the natural beds, and rise so high as even to threaten destruction to their banks. This slime used to be carried forward to the mouths of the rivers, and there collected in vast beds, which obstructed the access from the sea. The idea suggested itself—and an admirable one it certainly was—of forcing the rivers to deposit, for the benefit of the plains which they laid waste, the slime which clogged their course, and to repair themselves the damage which they occasioned. The plan conceived was to enclose with high flat banks the lands liable to be flooded, leaving an opening at the top to the river, so that when swollen by the rains it might be received in the bed thus prepared for it, and spreading out there, as into a vast lake, deposit on the land the slime with which it was charged. When, afterwards, the water had become limpid, advantage was taken of returning drought, to let it out into the river-bed from an opening in the lower part of the enclosure. Frequently there has been deposited by a single flood three or four inches of excellent slime. The operation is repeated as often as possible each year, and continued for three or four years, at the end of which time the soil accumulated commonly reaches such a height that the river can no longer flow over it, or at least to so small an extent as to make it no longer worth while to seek any further deposits from it. When matters reach this point, it becomes useless, as well as impossible, to continue the operation any longer. The level of the sort of table land thus formed, is now so much higher than the ordinary level of the river, that, instead of being liable to swampiness, it casts off its superfluous waters into the river's bed. The fertility of the soil deposited by these Colmata is almost incredible: one in my neighbourhood yielded the first season 120 sacks of corn from 5 of seed.

* From Simonde's Tableau de l' Agriculture. Toscane. A Genève, 1801.

To accomplish this process of the Colmata, it is necessary to have in the neighbourhood a river impregnated with mud of a fertile nature (for there are some rivers which are charged with nothing but sand and gravel), and of sufficient fall and length of course to enable it to receive by the lower sluice whatever quantity of water may be admitted by the higher sluice, however elevated that may be; and in works of such magnitude it is necessary that the proprietors have considerable courage and capital. The bank which surrounds the last Colmata made by the Marquis Ferroni, near Ballavista, is nearly three miles in circumference. It is of such thickness that the road, which would have had to go round about, has been carried along the top of it, and is shaded on either hand by poplar trees planted on the sides. It is intended to allow this bank to remain after the Colmata is completed, for the purpose of rearing timber. It is true that such works need not be made on so large a scale; it is even uncertain whether it be better to construct one vast enclosure, or several small ones. In large colmata there is proportionably a less extent of embankment to construct, because the proportion of the circumference to the superficies is as much smaller as the latter is larger; in small enclosures, on the contrary, it is not necessary to give to the bank either so much elevation or such thickness—the weight of water which they have to support being less considerable. The finest Colmata in Tuscany are, first, those of the Val di Chiana, which have rendered that marshy province the most fertile in the whole country. They have been formed chiefly under the direction of the Knights of the Order of St. Stephen. 2d. Those in the Plain of Pisa, the work of a convent of Carthusians, or rather of its steward, who, on account of his power over the waters, has been surnamed Neptune. And, 3d, those of the Marquis Ferroni, on the Val de Nievole, near the marsh of Fucecchio.

EXAMINATION OF THE PROOFS OF LEGISLATORIAL CAPACITY, FURNISHED BY MR. BABBAGE'S "ECONOMY OF MACHINERY AND MANUFACTURES."

Sir,—In your Magazine for the 8th of December, your recommendation of Mr. Babbage as a member of parliament, is prefaced by the following sentence:—

"Political matters do not, generally speaking, come within the province of this Journal, but when the interests of science happen to be mixed up with them, why should we be silent?"

Upon this text I wish to speak, and must crave your indulgence, and that of your readers, while I endeavour to show that political knowledge—not party politics, which I, as much as any man, abhor and detest—that political knowledge is essential to the welfare of science, and of all those who profess it and profit by it, amongst whom your readers are the most immediate class. I am not single in this opinion, and shall quote the opinion of one of your own correspondents, Mr. Potts—a working man as I gather—on this point.

"Working men, generally speaking, have a very indifferent opinion of the Chancellor's *benevolent motives and sentiments*. They think that he wanted to lead them aside from the study of politics, in order that they might be kept the longer ignorant of their rights in society. Why we mechanics never supported in any considerable numbers Mechanics' Institutions, is because politics are there excluded; for nothing can persuade us but all systems of education are false, which do not teach a man his political duties and rights. If Mechanics' Institutes had possessed the power of giving the franchise to every member who had acquired knowledge enough to use it beneficially, there would have been a Mechanics' Institution in every parish."

Mr. Potts has herein unquestionably spoken the sentiments of the great body of the working classes. Whether they be correct or not, in their opinion of Henry Brougham, I shall not stop to inquire; but however the distrust of the "Useful Knowledge Society" may have arisen, it is clear that the existence of such distrust must destroy their utility, even if they were all able and honest men. I think it must be universally agreed, that, valuable as physical science may be, moral science is of still more importance. to speak technically, physical science is the tool to *work with*, moral science is the drawing to *work by*. Imagine an engineer's factory, robbed of all the drawings, patterns, scales, and measures, and the workmen commencing a complicated engine without them, and we shall have a lively picture of the present state of political society in England, without moral knowledge to direct physical power. Instead of the ablest men being chosen as directors or rulers, they seem to have been taken hap-hazard, even where honest men have been secured; and those honest men have been subjected to the control of a power composed of knaves and quacks. What would be expected from a factory whose foremen were thus selected? Yet, until moral knowledge shall have gained an ascendancy over physical knowledge, in this barbarous condition we must continue to

remain. I am no partisan. The eternal din of Whigs, Tories, Radicals, Conservatives, and Destructives—Gallant Colonels, and Honourable Baronets—are alike as "hebanon in the porches of mine ears." I can look through all this, and calmly view the laws which have been enacted, and their mischievous effects. I can observe in them, for the most part, but one tendency — self-interest on the part of the rulers, whose revenue was to be raised, and absurd and mischievous intermeddling where no laws were needed, even by those whose intentions were honest; like the ancient Act, still I believe unrepealed, by which it is provided, "that all pins shall be made with good and sufficient heads!" In the treatment of criminals too, the principle pursued has been revenge, and not prevention of crime. The heart of the good man bleeds while looking round upon the misery of his fellows, and he would sacrifice even his own welfare to ensure theirs. But how shall he educate the ignorant? The "taxes on knowledge" and the "useless" interfere to prevent him, and the ruling power prefers half a million of revenue per annum to the welfare of the people. He looks to private establishments: he sees a banking-house, whose affairs seem as multifarious as those of a government, whose clerks seem innumerable, and yet which all goes on prosperously. He asks the reason of this, and he is told that each clerk understands his business, and that moreover he is *responsible*, security being taken for his good behaviour. The whole business is well arranged, and if one clerk were to fail in his duty he would stop all the rest. The benevolent man looks at the government again, to make a parallel, and he finds that there is much ignorance, and no responsibility, amongst those who compose it, wherefore all goes on to ruin; and he argues, that such would be the case with the banking-house also, were ignorance and irresponsibility introduced. If one clerk were chosen because he hunted foxes well; another, because he knew "the division of a battle;" a third, because he knew how to sail a ship; a fourth, because he had been a coal miner; a fifth, because he possessed some acres of land; a sixth, because he could chip stones handily; a seventh, because he could garden, or superintend a farm, and so on; and if, in addition to all this, the clerks were engaged for seven years, without any security being taken for their good behaviour—no power of turning them out, and the whole funds of the establishment at their disposal—a bankruptcy would most likely be the result. Let any man of intelligence, who is devoid of prejudice, say whether this be not the case with the English government and the Parliament hitherto. What but the want of real *responsibility* occasioned the waste of the public property in building Buckingham palace, that hideous mass of stone, instead of applying it to the education of the people? What but *self-interest* prevented the passing of the Birmingham railway bill? What but *ignorance* caused the absurd interference with steam navigation, and many other things, so constantly mischievous, that people in business are accustomed to remark, that the only occasion in which an Act of Parliament can possibly be beneficial, is, when it repeals some other Act which has become a public nuisance the moment it has been put in force; as is most commonly the case.

In common with all those who love their species, I bitterly deplore the constant political excitement which leaves no time for the desirable object of humanising and refining the mass of the people. But the examples are rare of *irresponsible* government which have wrought any considerable amount of good. Names are bandied on both sides, but it is a most malevolent spirit which has endeavoured to harden the hearts of the poor, who labour under heavy grievances, by fixing on them the title of "Destructives." It is the great body of mechanics who are thus libelled, and all good men should join in anathematising the fiend-like purpose of those who would thus set the rich and poor at variance for the object of unholy gain. There is no remedy but a *responsible* government. Disguise it as we will, the public mind will continue to be, as it has ever been, the arena in which the great struggle must be maintained—the struggle which began with the barons, who resisted the *irresponsible* power of John, and which struggle will not cease till the power of the people shall be legally as well as morally acknowledged. Wise laws cannot be framed, so long as the seat of legislation is converted into a battle-ground. When the people shall possess a perfect control over the election of their representatives, free from all influence but persuasion and argument, and when those representatives shall be elected only for a short space of time, it will be equivalent to taking bail for their good behaviour, as is practised in the case of the banker's clerks; and the representatives, after some trials, will be selected from amongst the most efficient men. I ask you and all your readers, if there can be a hope of public quietude till this matter shall be accomplished? If they agree to

the proposition—which in my judgment appears to be unanswerable—I do most earnestly exhort them to lend their assistance, through persuasion and every peaceable means with every human being to whom they are known, to bring the struggle to a close in as short a space of time as may be. To hope for good government while the contest is pending—that contest which can never end but in the people being victorious, is to hope for an impossibility. It may be protracted for years, but it can only be protracted; it cannot be put an end to, till the fight of freedom be won, and the self seekers be routed. It is not a contest of mere men. It is a contest of principles, the good against the evil. The men may die off on both sides, but the next generation will go on with the struggle, and when the good principle triumphs over the evil, the struggle will cease. In what I have said, let me not be misunderstood as wishing to convert our legislators into attorneys, for the transaction of business which is set down for them. Far from it: I wish them to be elected to exercise their own judgment; but I wish the people to have the power of dismissing them at short intervals, in case they prove imbecile or mischievous.

I now come to the qualities requisite in a legislator. You have recommended Professor Babbage. I do not dissent from your recommendation, because that gentleman, with all his deficiencies, is immeasureably superior in intellect to the class of persons from whom legislators are usually selected, and as he possesses the power of thinking, possesses consequently the power of correcting his errors. In alluding to his errors, I speak of those set down in that very useful work published by him, "The Economy of Manufactures and Machinery." I do not agree with you, that a man versed in *physical* science is therefore well calculated for a legislator. *Physical* science may be of great collateral use to a legislator, but it is upon *moral* science that his structures must be based. Before he proceeds to legislate at all, he should know the proper boundary of legislation. Many of the legislatorial evils we labour under, arise from over-legislation, such as the mass of laws made for what is called the protection of trade, *i. e.*, preventing foreigners from bringing goods *to* us, and consequently preventing them from taking goods *from* us. To know what is the province of legislation is the first duty of the legislator, and after that, to legislate wisely upon those matters which pertain to his employment. We do not set a tinker to make a steam-engine; why then should it be supposed that an engineer, or professor of physical science, can work upon those matters which require an intimate acquaintance with moral science? The knowledge of moral science does not come by instinct, any more than the knowledge of physical science. We should think it strange to set a man to make one of Professor Babbage's calculating machines, because he had been a legislator. Is it not as strange to set Professor Babbage to legislate, because he has made calculating machines? "Shoemaker, stick to thy last!" was the advice of the painter of old, and it was good advice. I have before said, that Professor Babbage is infinitely preferable to our absurd mass of lawgivers; therefore it will not be supposed that I apply the phrase to him offensively; but I wish to impress on the reader the fact, that as more knowledge and more study is necessary to constitute a legislator than is necessary for any other profession, it is somewhat more important that a man should be duly trained to it than a shoemaker to the making of shoes. Yet, strange to say, if a trained shoemaker makes a misfit he loses his custom; but an untrained lawgiver is allowed to go on making bad laws during half his existence, to the endamagement of a whole community. A tailor, or a hatter, or a weaver, must serve seven years before they are capable of working at their trades; but a soldier, or sailor, or merchant, or brewer, or machinist, or distiller, or fox hunter, or novel writer, jumps at once from his trade into the seat of legislation, and becomes a lawgiver by instinct. There is another important matter. Professor Babbage, like most men of science, has paid more attention to his profession than to the science of money-getting. I have understood that he is not a rich man, and that the salary attached to his chair is a consideration to him. How is he to attend to his lectures, and his machine, and the business of legislation, all at once, even supposing him to possess talents for all? Is it not monstrous, that the science upon which, of all others, the welfare of the community depends—legislation—should be the only one whose professors are unprovided with the means of subsistence, to enable them to attend exclusively to it! It is partly in consequence of this iniquitous neglect of the maintenance of our most able men, that the business of legislation has dwindled down into an after-dinner amusement for the idle, the vain, and the profligate of those classes of the community who have inherited ample means from their ancestors, or who have acquired them either by successful trade or gambling speculations. All those who honestly wish that the business of the nation should be

well done, ought to insist on their representatives and legislators being paid for the services they render.

As I have freely censured the deficiencies of Professor Babbage, it is fair that I should state them.

You speak of his "searching and business-like habits." I grant that he has displayed great and praiseworthy industry and much acuteness in successfully adapting portions of different machines to the object he has had in view; but if by "business-like habits," you mean a general knowledge of the operations of trade, which constitutes a portion of the science of political economy, I must deny your proposition, and convict him from his own work. In his strictures on the bookselling trade, his reasoning is based on a fallacy from first to last. He makes a statement of the prime cost of his own work, and then shows that some 33 per cent. of the retail price goes into the pocket of the publisher. This assumes that the business of publishing costs nothing—that no labour is expended upon it—that the moment the book is ready, the public will pour in and take it from the publisher's counter for ready money. This is not so. A portion of the per-centage is divided amongst the trade who help to retail the book. In the case of the Professor's work, which became deservedly popular, a rapid sale was procured: but is this the case with all books? It is an unfair statement. The question really is, what is the average profit which the publisher realises upon the whole of the books which he publishes within the year, some of which "make a hit," and many of which are a dead loss. If we look around amongst the booksellers, we shall pronounce that their success is not greater, that they do not make larger or more rapid fortunes, than other tradesmen, as compared with the capital and the talent they employ. If one man amongst them prove more successful than his brethren, it will be found either that he has more skill in puffing, or more interest with the professional puffers, or more judgment in selecting the works he publishes. Some houses make it a rule to publish every thing which offers, trusting to their puff-power alone; and doing by this means a large amount of business for a given number of years, secure a sufficient profit before they are found out by the public. But the cause of this is not the established 33 per cent. upon each book: the publishers never realise any thing approaching to it. The cause is, that they rival the blacking men in puffing. Generally speaking, the booksellers are far from an intelligent class of men. They cannot judge of the value of a work, either in intrinsic merit, or improbable popularity. They suffer an author to write himself into notice, mostly at his own risk; and when he has succeeded they will publish any thing he may offer, even without examination. But Professor Babbage is utterly wrong in setting forth the prime cost as the whole expenditure of capital on a book. The labour and expense of publishing and retailing is frequently greater than that of the wrought material; and, without this labour and expense, the work in many cases would not circulate at all. As well might the cheapness of the Birmingham and Sheffield toys be cited as a proof of the large profits of the perambulating Jews who sell them. They probably realise 200 per cent. on the sale, but how much do they sell? The fact is, they are just paid about the rate of their personal maintenance for their labour in the process of distribution. Their return is small, and if they did not get the large profit they would cease to be distributors, from the impossibility of their living upon the amount of their earnings. If Professor Babbage would wish to diminish all profits in trade to the exact per-centage which he thinks it fitting capital should produce, what would become of the hordes of green-grocers, chandlers, shopkeepers, and others, who probably realise cent. per cent., and who could not live unless they did so? Before he legislates on the per centage, he must increase the quantity of business for each person, unless, upon second thoughts, he should think it wiser to leave the matter to the guidance of those interested in it. The fact is, that booksellers must get a large profit on the books which do sell, in order to compensate the loss on those which do not sell: and if the authors wish to remedy the evil, they must resolve amongst themselves to write no bad books or no unpopular books, and deal with no bookseller who publishes any such books. Bookselling is like most other trades: if the profits be enormous, capital will soon flow into it, and competition will reduce the profits. No men gain very large profits, unless in the case of doing desirable things which others cannot do. There was *one* Walter Scott—and he had his own price for his books; there are *many* publishers, and the public can choose amongst them.

Professor Babbage, adverting to the "truck system," advises legislative interference in order to oblige the masters to pay wages in money. Laws exist to this effect; but if they availed, they would be a most mischievous interference with commerce, and would produce many bad results without a single good one. If it were good policy to specify by law the

quality of wages, it were also good policy to specify the amount. Would Professor Babbage do this? If he would, he should also go on and prescribe by law the number of men who should be employed. The whole of such a system would be absurd. Wages are altogether a matter of bargain between the employer and labourer, and each makes the bargain to suit his own convenience. To interfere between them is to destroy that freedom of trade of which Professor Babbage says he is an advocate. The "truck system" is never resorted to in England until supernumerary workmen exist. The first-rate workmen are employed in preference at money wages; and those who are left without work, offer their services at a cheaper rate. Mr. Babbage appears to know something about the earthenware manufacture, in which this "truck system" is to some extent carried on, and I will therefore take an example from it. On one occasion, when work was "slack" in the Staffordshire Potteries, a number of the inferior workmen, who were left without employment, applied to a manufacturer, offering to take work at a lower price. The manufacturer replied, "I cannot get a sale for my ware unless I can take it into the market at a reduced rate. If, therefore, in addition to working at lower wages, you will agree to take those wages in articles of your ordinary consumption, which you are accustomed to buy at the chandler's shop, I shall be enabled to get the chandler-shopkeeper's profit, and be also enabled to sell my ware at prime cost; thus securing a market, while you will be just as well off as if I paid you your wages in money." Would Professor Babbage have legislated to compel the master to pay in money in this case? If he did, the consequence would have been that the men would have got no work whatever. But, after the work had been thus carried on for a considerable period, the cupidity of the manufacturer, and another reduction of prices, induced him to buy provisions and clothing of an inferior quality, which he distributed amongst his workmen at the same rate as those of superior quality. The workmen grumbled and complained; and the manufacturer told them he could not afford to give them any thing better. They in consequence left their work, and went all round the district to seek for another employer. Not finding one, they again returned to the old one, who, after a time, finding that he could get more profit upon clothing than upon provisions, ceased to supply provisions, and paid the whole of the wages in clothing, which the workmen were obliged to sell again at a loss, in order to purchase provisions. They grumbled as before, and tried to procure work elsewhere, but as none was to be had, they again returned to barter their labour for clothes, on the principle that half a loaf was better than no loaf at all. "A drowning man will catch at a straw," and a hungry man will feed on garbage rather than not feed at all. This is truly the whole history of the "truck system." I am no upholder of the inhumanity of the manufacturer, who perhaps squeezed his workmen to the uttermost. I abhor the callous spirit which can feel contented while extracting a profit from human misery. But what law can reach such a case? At no period of the transactions could the manufacturer afford to give sufficient wages, and to have compelled him to pay in money would have been equivalent to forcibly closing his workshops. There would be as much justice in compelling workmen to labour at a fixed rate against their will, as there could be in compelling the master to carry on his business after a prescribed pattern. There is but one remedy, viz. for the workmen to cease from bringing up so many of their children to the business. If the supply of workmen be less than the demand, they will all be sure of high wages. This is the "truck system" in England; but it exists in other parts of the world as well. I will give an instance.

In one of the northern provinces of Chile, a native of Spain, named Don Jose * * * * * * possessed a large estate consisting of table land, on the borders of the rapid river Chuapu. As rain rarely falls there, cultivation is only carried on by means of irrigation. Having surveyed the land, Don Jose found that it was practicable to cut a canal from the river, by ascending it about two leagues, and thus to lead the water on to the table land of his estate, and bring it into cultivation. But there was another matter to consider. As the estate was situated at a great distance from any market, what was to be done with the produce, in order to turn it to account? After some consideration Don Jose set his people to work, and, at an expense of many thousand dollars, he made a canal, nine miles in length, skirting the angles of the neighbouring mountains, and in many parts cut through the solid rock, six feet in width and three in depth, from which he had at last the satisfaction of beholding the water flowing in an ample stream over his land. He then purchased the right to some ancient gold mines, which had been worked from the period of the Conquest, but which had for many

years been abandoned and under water. Men were set to work in gangs, relieving each other, to carry out the water on their backs in goat-skins. This primitive method of draining a mine was at last successful, and miners were set to work to get out ore, the draining work being constantly kept up at intervals. The method pursued was, hollowing out in the different levels of the mine large stone cisterns, and employing different gangs to carry the water from the lowest level to the one above, and so on, till the last gang discharged it into a cistern communicating with an adit. The men, and some women also, worked naked, with the exception of a rag round their loins. The payment of the miners or chissel men, who blasted the rock, was ten dollars per month, and their provisions, consisting of sun-dried beef and coarse bread. The labourers, *i. e.*, water-bearers and ore-carriers, gained seven dollars per month, and their provisions. The gold which was extracted was scarcely ever sufficient to pay the men's wages, whose numbers averaged from 150 to 200 men. Where, then, was the use of working it? will be the reflection of the reader. The men were hired on the express condition of purchasing all their provisions and necessaries from the owner of the mine, who kept a shop for that purpose, and thus turned the produce of his estate to account. This was the "truck system" in Chile. The miners never saw any money. Their wages were estimated in money, but they were paid in provisions and necessaries for their families. Had the Chileno government prohibited the "truck system" the consequence would have been, that three hundred families would have been deprived of their maintenance, and a certain amount of capital, accruing from profit, lost to the country.

You remark, in your recommendation of Professor Babbage, that he has "shown great independence of spirit." I cannot agree with you. In your review of his work on the "Decline of Science" you reprobated his querulous craving after personal distinction, as utterly unworthy of a wise man, and as seeming to indicate a "love of science," not "for its own sake," but for the sake of the power and personal distinction it might confer. The childish longing for the paltry gewgaws of the Russian autocrat was the outward and visible sign of any thing but a masculine mind, and tempts one to believe that a mathematician and calculator may, after all, be but a second-rate person,—that he may be wound up to his work like a machine, without needing any very strong exertion of the power of judgment in the modes required for a legislator.*

That Professor Babbage would be a friend to the inventive classes I can readily believe, and this is desirable. I profess also to be a warm friend to them; but I incline to think that you misunderstood me in your criticism of the "Producing Man's Companion." I wish them to be far better and more effectually rewarded than they are at present. I agree with you, that if patents are granted at all, they should be granted with as little expense as possible. But I think them a mischievous mode of recompensing invention. If an invention be useful, the inventor ought to be publicly recompensed, in proportion to its utility or the number of persons to whom it might prove serviceable; and this in the shape of an annual pension, terminable by death. The possible selfishness or the mischief resulting from the want of judgment of an inventor, might thus be guarded against, and the whole of the public might at once profit by the invention, without being subject to his possible caprice. If there were no expense attending the taking out of a patent-right, every schemer would take one out for every absurdity, and a monstrous mass of lawsuits would ensue. Besides, many useful speculations would probably be stopped by unforeseen claims. At present, the patent-rights merely serve as a monopoly to the rich man, and do little good to the poor man. It is very desirable to correct this.

Under the head of "Copying," Professor Babbage seems undecided as to the process whereby engravings are copied on a larger or smaller scale. It is by means of elastic cakes of glue and treacle combined, and has long been practised in the

* When we spoke of the "great independence of spirit" shown by Mr. Babbage, it was with special reference in our minds to his unquestionably independent conduct as a Fellow of the Royal Society. We thought, and still think, that a gentleman who could, single-handed, make so stout a struggle for reform as Mr. Babbage has done in so close a body as the Royal Society,—when, if he had listened to the dictates of personal ambition, he would have yielded a ready assent to every measure of the ruling clique—might be reasonably expected to make a national reformer of the first water, when supported by so important a constituency as that of Finsbury, and encouraged by the plaudits of a whole people. Neither do we think it as at all inconsistent with a very considerable degree of independence of spirit to hold even empty titles of honour in high regard. We may deem it in a philosopher a weakness (and what mind is there so noble as to be without its infirmity?), but it is not necessarily servility. Although obsequiousness and sycophancy be the ordinary modes by which such distinctions are obtained, experience tells us that they are also occasionally reached by conduct of the loftiest and most unbending description.—ED. M. M.

potteries. Amongst the varieties of copying, he has omitted all mention of the very beautiful iron castings, called Berlin work. It is a great desideratum amongst English workmen to be made acquainted with this art, which has, I believe, hitherto been kept a secret. The knowledge of it would open a very wide field for the production of beautiful objects; and let it ever be borne in mind that works of beauty, though commonly scoffed at as being of no use, because they do not increase the quantity of people's food, are in reality of the highest utility, on account of their humanising tendency, by calling forth all the kindlier feelings of the human heart. What man, after his bodily wants are provided for, can look forth on the glorious and placid ocean, and on the bright starry arch above it, without feeling cheered and elevated by the sight? What man can walk through a beautiful garden, or a magnificent forest, and not feel sensations of refinement steal over him? What man can gaze on a beautiful woman without emotion? What man can walk through a Grecian temple, and look on Grecian sculpture, without becoming conscious of higher capabilities than those of the "beasts that perish?" What man can gaze on a form of beauty, either in nature or in art, without gazing in delight? I once watched a rude scavenger, mud-bedaubed from head to heel, and coarse as imagination could conceive, staring in mute wonder, as Cymon did on Iphigenia, on one of Martin's engravings in a shop-window in the Strand. He heeded not his companions as they moved on with the cart, but remained motionless, resting on his "scoop," One of his fellows came up to him, and coarsely shaking him, asked "what he was staring at like a stuck pig?" The reply was, pointing to the engraving, "My eyes! only look!" That man had the sense of beauty within him, and probably the precious spark was then awakened for the first time. The genius of poetry struggled into life through the rough enclosing husk of mortality. Who shall say how much godlike genius lies hidden in the mass of the nation, which is never called forth for want of fair play? Let those who love their species, who believe in the constantly progressing power of humanity, lend their aid to secure to all the children of humanity a fair sphere of exertion, by the promotion of wise and benevolent institutions, through securing the *responsibility* of those who hold the situations of power.

In speaking of the various kinds of "power" of which human beings have availed themselves for machinery and other purposes, Professor Babbage has omitted what seems to me the great source of all power—*Heat*. If we take a windmill, we say it is driven by the power of the wind, *i. e.*, atmospheric air in motion. But what power puts the air in motion? *Heat!* One portion of the atmosphere is rarefied by the action of the sun, and the air rushes from other parts of the atmosphere to fill the partially empty space as it cools again. We talk of a mill driven by water power. But what gives power to the water? *Heat*, which raises water in vapour from the surface of the ocean, and which vapour, converted into rain, or snow by subsequent cold, falls upon mountains and high levels, from whence it descends in rivers and brooks, to the lower lands, and again joins the sea from which it was originally taken. If we talk of steam power, we still must revert to *heat*: the steam is produced by the combustion of coal. It is tolerably certain that coal is of vegetable origin. Vegetables are produced by the action of the sun, *i. e. heat*. If we use the gas engine, still we revert to *heat*. If we use animal power, still *heat* is their source of power. An animal, when deprived of its *heat*, is dead and powerless. Even the feeble power which the sensitive leaf exerts, is caused by *heat*. The power of the earthquake has its source in *heat*. The power of gunpowder is communicated by *heat*, and with the single exception of the cold-blooded animals, I am not aware of any "power," of which human beings can avail themselves, which is not traceable to the same source. How far the cold-blooded animals are exempted from this general law, or from what source their power arises, we are not yet skilled enough to ascertain.

To conclude, I look forward confidently to a time, when the evils under which human nature at present labours will for the most part be removed. Most of them may be traced in their origin to misgovernment; and in reverting to the necessary means for removing them in England, the ultimate end of the analysis has been "Reform in Parliament." Whatever has been proposed by good men or wise men, for the advantage of the public or the interests of humanity, has been constantly wound up with "We must get a Reform in Parliament first." It is only by means of education being extended through the mass of the people, that both governments and demagogues can be deprived of the means of mischief, and, for want of a Reform in Parliament, education has hitherto been stopped. How glorious will be the result when we shall become an educated

nation,—when all public objects shall be pursued with the same earnestness, the same care, the same skill, and the same knowledge which is now applied to private ones! When an educated public, capable of comprehending men of genius, shall call men of genius forth to an ennobling popularity, what a measureless increase of motives will men of genius possess to urge them to exertion, when compared with the heartless payment they at present get "under the cold shade of aristocracy!"

The years I have numbered are not many, but I have carefully studied the capabilities of my fellows, and most pleasing to me is my deliberate conviction that the elements of all good may be found amongst them, while the evil they do is for the most part the result of misery, which good and wise government would prevent. I have made my election—through good and through evil—in life and in death, if need be—to aid with my whole power, be it much or be it little, the accomplishment of that most desirable end,—a government which shall be *responsible* to the people. I count upon living many years, while a scant three hundred, chosen by the whole nation, from amongst the best and wisest men of the nation, maintained by the nation, and *responsible* to the nation, shall compose the great council of the nation, to do the nation's work, and live and die in the cheering consciousness of possessing the nation's gratitude.

I remain, Sir, very truly, yours,
JUNIUS REDIVIVUS.

Dec. 12, 1832.

P.S.—I feel much obliged to Mr. Mackinnon, for pointing out the errors in my letter on American steamboats. As my only object is truth, I should feel pained at being the means of giving false impressions. The matter in question, however, is evidently an error, from its very absurdity; but as I have neither my notes nor letter by me, to refer to, I cannot say what it ought to be. I think that I stated in the letter, that I would not vouch for the accuracy of the measurements, beyond a general approximation. In fact, most of them were from the information of the engineers on board, and the sizes of the wheels, &c., might be either more or less. Whatever I have stated on my own knowledge, may, I believe, be taken as correct. If I am wrong, I shall be obliged to any of your readers who will take the trouble to correct me. *I* am nothing—*truth* is above all. My motive in writing the letter was in the hope of exciting discussion, from which truth was ultimately sure to arise.

Earthquake in England.—Extract of a letter from a correspondent of the *Times*, dated Swansea, Dec. 30, 1832:—"A shock of an earthquake was felt here this morning, by far the most violent remembered in this country. I was in my garden, and at 20 minutes past 8 o'clock I heard a noise like the distant firing of heavy artillery, which came booming from S. W. by W.; in about two or three seconds it was succeeded by about four violent vibratory motions, which continued altogether from a second to a second and a half, and passed on in a direction N. E. by E., the sound apparently preceding the shock. As there was no obstacle for several miles, it was distinctly heard passing in that direction for several seconds after the shock had ceased. The motion seemed to be that of a wave extending in a N.W. and S. E. direction, and passing from S.W. by W. to N.E. by E. Its effects were very considerable; I felt myself shaken to and fro several times. Some trellis-work near me was much agitated, and in the house glasses clattered and the furniture was moved. The inmates eagerly inquired of each other the cause of the commotion, and the neighbouring cottagers ran into the street, and could not comprehend what was the matter, but all were much alarmed. Four or five bricks were shaken from the top of an old glass-house, about 90 feet high, 400 yards eastward of me. The building must have suffered a violent concussion, as many other bricks are displaced. The morning was cloudy and calm, but unusually fine and mild for the season. Barometer 30 in.; thermometer out of doors, 42 deg. It is remarkable that though no alteration has taken place in the appearance of the weather, which still continues cloudy and mild, the thermometer now, at 2 o'clock, stands at 46 degrees."

INTERIM NOTICES.

☞ *The office of the Mechanics' Magazine will be removed, on the 18th instant, to No. 6, Peterborough Court (between Nos. 135 and 136, Fleet-street), where all communications, after that date, are requested to be addressed.*

The length of the two valuable and interesting articles, on Reclaiming Land from Rivers, and on Mr. Babbage's "Economy of Machinery and Manufactures," and which particular reasons of utility have induced us to give in an entire state, has necessarily produced a less degree of variety than usual in our present Number. We shall endeavour, however, to make up for it next week.

Communications received from Galena—Mr. Cheverton—Quivis—Junius Redivivus—Mr. Beare—Mr. Baddeley—G. L. S.—F. H.—Mr. Potts—Mr. Ashton—Mr. Skaife—Mr. De Wykes.

ERRATUM.—In Mr. Milne's letter, inserted in our last Number, 4th line from the end, after "I would" insert "avoid."

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Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

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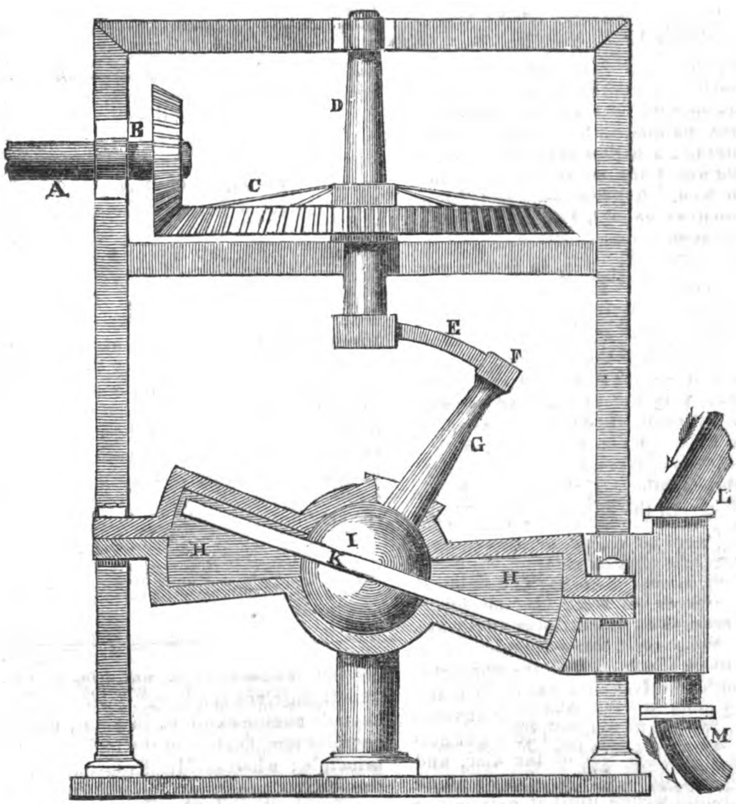
"The object of all honourable exertions is that we may stand higher than our fellows; not by thrusting them down, but by raising ourselves up; and we nowhere get the vantage ground, so much or so certainly, as when we are in a condition for making discoveries that may and must be useful to others."—MUDIE.

DAKEYNE'S HYDRAULIC ENGINE.

Fig. 1.



DAKEYNE'S HYDRAULIC ENGINE.

Sir,—I have been much interested by reading in your valuable Magazine the account there given of Mr. Ericsson's steam and water-wheel, and the controversy to which it has given rise. I must take leave, however, to mention that a hydraulic apparatus on a similar principle was invented (and I think patented) two or three years ago by two persons in Darley Dale, of the name of Dakeyne, and that an engine on their plan, of very considerable power, is now actually at work at a lead-mine belonging to Messrs. Allsop and Co. I have little doubt, too, that it will come very generally into use in this part of the country, for we have many mountain-streams where the fall is great, but the supply of water so trifling that you could not apply an ordinary water-wheel upon them to be of any service, while the apparatus of the Messrs. Dakeyne may be employed under such circumstances to the greatest advantage. You have only to carry a pipe up to the hill-top, and let the water act upon one of these half-oscillatory half-revolving disc engines, and you get a power available for any purpose, and a rotary motion to boot. A little leakage is of no consequence; you need no packing, and as long as the stream will flow and the machine will wear, it is, in fact, a perpetual motion. The accompanying sketches are from memory, but they may help to give your readers some idea of the construction of the engine.

Fig. 1 is a vertical section of the apparatus. A is the driving axis in connexion with the wheels B C. D, a revolving axis. E, a crank arm, with a ball-joint F. G, an oscillating axis. H H, the chamber. I, the globe. K, the disc edge. L, the entrance pipe. M, the exit pipe.

Fig. 2 is a ground-plan. A is the entrance-pipe. B, the exit. C, a flat disc, fitting the chamber. D, the globe. E, the oscillating axis. F, the stop-plate. G, a flange. *eeee*, screw-bolts.

It will be observed that the apparatus has neither valves nor cocks, nor any packing about it; the stop-plate answers the purpose of all these. The water acts first on the under side of the disc, and then on the upper side, and flows round like a liquid wedge until it gets out at the exit pipe. The crank-arm keeps the flat of the disc against the top and bottom of the water-chamber.

As I have drawn up this brief notice from recollection, it can have no pretensions to mechanical exactness; but you have a correspondent at Cromford, Mr. John Leonard, who could, I dare say, supply any corrections in this description, or any additional information that may be wanted.

I am, Sir,

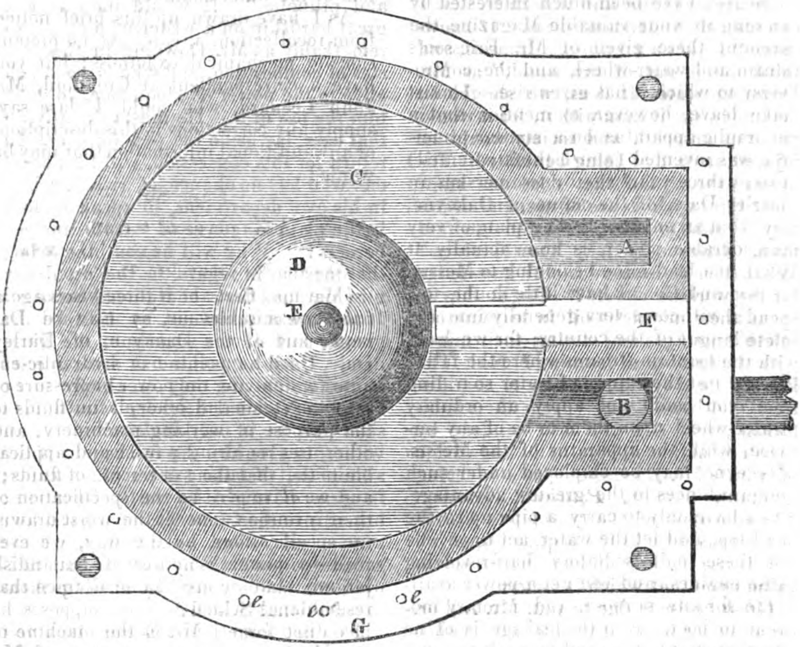
Your obedient servant,

GALENA.

Wirksworth, Derbyshire, Dec. 28, 1832.

[We find that about three years ago a patent was taken out by Edward Dakeyne and James Dakeyne, of Darley Dale, "for a machine or hydraulic-engine for applying the power or pressure of water or steam and other elastic fluids to the purpose of working machinery, and other uses requiring power, and applicable to that of raising or forcing of fluids;" and we have perused the specification of their invention (one of the worst drawn-up specifications, by the way, we ever read—a perfect smother of outlandish jargon); but we are unable to trace that resemblance which Galena supposes he has discovered between the machine of the Messrs. Dakeyne and that of Mr. Ericsson. The two inventions appear to us, on the contrary, to be founded on perfectly opposite principles. In Messrs. Dakeyne's engine a *tilting* motion is given to a circular plate by means of what the inventors term "the spontaneous reversions of the force of the fluid to the contrary sides;" so that the centre of the plate becomes the fulcrum, and the faces of it the levers, by which the power is obtained. In Mr. Ericsson's engine, on the contrary, the power is produced by the continuous *circular* movement of certain radial wings or pistons, in such a manner that, when in one particular position, they present their full surface to the steam, and when in the opposite retire from it,—the shaft to which the pistons are fixed, and round which they revolve, being in this case the fulcrum, and the pistons themselves the levers. Messrs. Dakeyne's engine exhibits, in short, only a peculiar modification of the reciprocating principle; whereas Mr. Ericsson's is, in the strictest and fullest sense of the term, a rotary-engine, and derives whatever excellence it possesses from the skill with

Fig. 2.



which a direct impulsive force has been obtained from a harmonious combination of perfectly circular movements. — Ed. M. M.]

EDUCATION OF THE WORKING CLASSES.

"Controversy makes falsehood appear more false, and truth the more true."—Milton.

Sir,—Your love of fairness will, I am sure, induce you to give publicity to the following remarks.

In answer to my statement of the opinion that the industrious classes entertain of the Chancellor's *kind and benevolent motives*, Mr. Downing says, "it is strange that I should now hear this for the first time!" This ejaculation of surprise is no refutation of the fact. As a proof that we have reason for our opinion, look at the answer that was returned to your sensible correspondent, Mr. Lyon, when he wrote to the Society, at the head of which is Lord Brougham, to correct a palpable falsehood published by them in the *Penny Magazine*—"Their work did not permit them to sift out the truth!" However, as the principle I maintain, namely, that all systems of education must be false which do not teach men their political duties and rights, has not been controverted, I ask what becomes of Mr. Downing's assertion, "That the study of politics is worse than time lost to working men?" I maintain that it is the progress which they have made in this important branch of education that has laid the foundation of a political power, the numerical strength of which gained the Reform Bill; and what good it may ultimately do, few men can calculate.

In Mr. Downing's first letter, he used the old sophism the rich are so fond of —that a little learning is a dangerous thing. It is very important to the useful classes that this question should be fairly settled. If learning be a good and desirable thing, it follows I think that a little learning is better than no learning. We never hear persons say that a little bread is worse than no bread; on the con-

trary, they say, half a loaf is better than none. Mr. Downing's ideas of knowledge are so vague and indefinite, that I can scarcely understand them. If knowledge "makes a man forget himself, and think he is out of the world," as Mr. Downing states it does, we should be better without it than with it, for it would make us unsocial, and society would be injured, instead of being benefitted. Tillotson says, "He that does not know those things which are of use, and necessary for him to know, is but an ignorant man, whatever he may know besides." What then is the most useful knowledge for the working classes? Ought they to spend their midnight oil in learning obsolete languages and storing their minds with the lumber of learning? No! The knowledge they want is how to stop distress, and banish misery from their habitations; and this can only be done by the study of that science, of the knowledge of which Mr. Downing boasts of being ignorant, namely, *Political Economy*. The education of the productive classes ought to consist in the acquisition of all that is useful, and in learning to set no value upon that which is *useless*.

Great praise is due to you, Mr. Editor, for allowing working men to give publicity to their ideas on this important subject. Hitherto the unwashed artisan (as he has been insultingly called) has only been thought fit to minister to luxury and idleness, by wasting the bloom of life in unremitting toil, by rising early and going late to rest, to eat coarse and scanty food, to suffer and to die. But saving knowledge is amongst us now, and it must spread till it covers the earth as the waters do the sea. A revolution, not of blood, but of principles, has began its silent march: a spirit of inquiry is abroad, and no power on earth can retard the progress of human improvement.

Yours, &c.,
ROBERT POTTS.

January 2, 1833.

Sir,—Will you permit me to occupy a few lines in your Magazine, in reply to Mr. Downing's last letter?

In noticing the declamatory style in which his former epistle was couched, it was with no intention to decry declamation *in toto*, but simply to suggest that *the facts* on which a person declaims should be indeed facts, and not mere assumptions; otherwise declamation loses its relish, and becomes mere "leather and prunella." It would indeed be a great hardship on a writer who excels so remarkably as Mr. Downing in this species of composition, and who is so much alive to the power of eloquence, to deny him the use of it. He must evidently, in that case, lay aside his pen for ever. In return for this concession, will he permit one who has no chance of rivalling him in his own department, to speak to him in the plain language of "truth and soberness?" Why will he continue to beg the question in regard to the peculiarly mischievous effects of National Schools? If *they* are mischievous, so must be the greater part of the schools in the kingdom. Until he points out some *special* abuses which are only or chiefly to be found in National Schools, I must consider that he is only declaiming. I am willing to give him the full benefit of the admission, that the system of education *in general* might be vastly improved; but why in the name of common candour are not all visited alike with the same condemnation? Why assume that children are made WORSE by sending them to a National School?

I do not forget, Mr. Editor, that you have cited proof of the badness of the system pursued, especially in relation to the neglect of moral culture; but it appears to me, that inquiries have been confined too exclusively, and apparently with too microscopic an eye, to the abuses in this particular class of schools. The real question is, whether the same objections will not apply far more extensively than these condemners of National Schools suppose; and also whether, with all its defects, the instruction imparted by them is not better than having no instruction at all?

Mr. Downing reiterates his assertion that the idea of placing a child in a National School is debasing; and it must be confessed his defence of such a sentiment is sufficiently hardy. If the parent (he says) do not feel debased on such an occasion, he must be debased himself!! This is the most convenient mode of proof which I ever remember to have seen. No doubt a "rich man" *would* think it degrading to have his son educated in a National School, for the most obvious of all reasons; but the truth is, the rich have nothing to do with the matter: it is

simply and solely (as far as "debasement" goes) a question for the poor to decide.

I am, Sir, your obedient servant,

VERAX.

London, January 7, 1833.

Mr. Editor, With all the erudition which Mr. Downing displays,—poetry and gardening into the bargain,—he does not appear to have yet attained that real philosophy (at this moment so well exemplified by many, even of his class and acquaintance,) which consists in bearing the many and grievous ills of life without declaiming on the ingratitude of the world. By some most extraordinary process of reasoning, he attributes the result of his own peculiar circumstances to the fault of learning. Never was learning so libelled. Mr. D.'s logic is like that which Burke is said to have described as "having the cogency of nine-pins, the arguments civilly knocking each other down." Neither can I give him that credit for candour which I should like to do. He must know well, that he has shuffled out of the question about National Schools. He knows that he was *not* "endeavouring to prove" merely that they are "not what they ought to be." Mr. D. positively asserted that they were productive of considerably more harm than good.

The idea that Mr. D. has put forth on the influences of wisdom, is as novel as it is extraordinary. Would Socrates have wished he had known less, because he knew no more? A man in the pursuit of knowledge is constantly on the advance—conquering his prejudices as he proceeds, and still finding the field wider and wider before him. But he does not "retreat from himself:" there is no meaning in the phrase; and it is nothing but a melancholy perversity of intellect to suppose that a man is, or ever was, degraded in his own estimation by wisdom, whether much or little. If a man feel himself so debased, it is a sad proof that he has "studied himself into a fool" indeed. Blame is seldom attached to "declamation," when it is accompanied with truth and sound reason. But if fine-sounding words and elaborate periods are paraded forth with a "plentiful lack" of sense, and innocent of any meaning save the vain display, they too forcibly remind us of the man who, perambulating the streets of Mecca, cried—"In the name of the Prophet—figs." The greatest thanks are due to you, for the exertions in the cause of knowledge that you have made; and a firm conviction on my mind being that it is your wish that truth should be known, has induced me thus to intrude on you. It is something towards exhibiting truth, if we strip her of the errors with which enemies or false friends encumber her.

Your constant reader,

AUGUSTUS FREDERICK ASHTON.

5, Old Quebec-street, Oxford-street, January 2, 1833.

MAGIC LANTHORNS—ETCHING—EXTEMPORANEOUS TOOTH-POWDER.

Sir,—The difficulty of procuring good transparent varnishes in the country, and of laying them on, is so great, that I have never seen any good slides for magic lanthorns made out of London. I send you, therefore, an account of two different methods that I have made use of for some time, by either of which this difficulty is obviated, and any persons who can draw or etch may make excellent slides for themselves.

1. Take a piece of crown glass and grind it to a uniform surface, free from scratches, with washed flour of emery. Lay it on the subject to be copied, and trace the outline with a good cedar pencil; then bring out the middle lights by rubbing the parts with a piece of soft wood, such as a skewer; produce the shades with the cedar pencil, softening them off with a pointed cork or roll of paper, and touch the high lights with a little mastic varnish; then black up to the outline with lamp-black and turpentine varnish. By this means statues, skeletons, &c., may be worked up to a greater pitch than they can be with the varnish.

2. By my second method the finest engravings may be introduced. Ink the plate with the best printers' ink, or apply coloured varnishes to the different parts, and carefully rub them off without mixing them; then pour on a clear solution of isinglass in weak spirit of wine, about the thickness of a shilling. In about 12 hours it may be taken off, and then fixed on a piece of glass and blacked up to the outline.

I have no doubt that many persons would learn to etch if it were not for the expense of the copperplates and the trouble of sending to the printers for impressions. I have found that common tin-plate will answer very well for learning upon, and that impressions may be taken in a smith's vice between two pieces of flat, thick cast-iron. The plate, however, must not be larger than cards. Choose the plate free from scratches; then cover it with etching-ground or bees' wax; trace the subject in the usual way; put on the border of wax, and in biting in use rather a weaker acid, 5 or 6 parts of water to one of nitrous acid; do not let it remain so long as on copper; the light parts must be stopped out in time, as the acid acts quickly upon it.

Charcoal has been deservedly recommended as the best tooth-powder, but this is to be understood as only so when it has been recently burnt. As it is usually sold in boxes, it merely acts mechanically. When used to correct putridity of any sort it should be powdered while still warm, and used immediately; but as this would be attended with too much trouble, the following extemporaneous tooth-powder may be substituted with these several advantages:—It would be recently burnt, and would act chemically on the teeth and gums; it would be mixed with finely-divided silex, which would act mechanically on the tartar, and it would not require to be pulverised; and it is made so easily that it is scarcely worth keeping it in stoppered bottles, if not used immediately. All that is required is to take a small bunch of wheat straw, to light one end of it, and to keep dashing it against the edge of a basin, from which it may be collected fit for use.

I remain your obedient servant,

G. Dakin.

Dereham.

FOOTING-IT, OR A NEW AND ADMIRABLE METHOD OF NAVIGATING CANALS.

Sir,—The last day of the old year was but a cold and cheerless one; so instead of sending out for the Monthly Part of your Magazine, according to my usual custom, I said, in my own mind, it would be a sin and a shame to turn a dog out of the house in such weather as this—I'll wait till to-morrow, and then I can get it myself.

But when the mind is accustomed to food, Sir, it looks for it as regularly as the body; and as it drew towards evening, I began to grievously miss the Magazine. So not knowing well what to do with myself, as the saying is, being, as you may guess from this, of the order of lone bachelors, up I got, and putting my beaver on, I sallied forth into the streets, resolved, as is my wont, when tired of home, to have a rattling ride of four or five miles into the country, just by way of jolting myself into vivacity again. I soon fell in with a stage coach, and, careless whither it was bound, committed myself to its friendly protection. Like all staid and sober Englishmen, I never opened my mouth for the first two or three miles; at last, however, I ventured to mention to a very charming young lady, who sat opposite to me, that it was a cold evening, and by degrees got on to state that it had been but a bad kind of day; and so, Sir, one thing brought on another, till at last we got quite sociable together, and leaving far behind us mere matters of fact, we wandered into the regions of fancy, and began to discuss how the weather might be on the morrow; our gaiety of heart increased every minute, and at last we talked ourselves into as fine a nap as ever mortal beings need wish. On awaking and looking up, behold it was daylight. "Why, coachman," exclaimed I, thrusting out my head in utter amazement, "where are we?"—"Close to Coventry, Sir," replied the knight of the whip. Well, thought I to myself, this is mighty fine work! Mine is a steady family, Sir, and my ancestors on the male side have been citizens of London for the last five generations; one of them was within three of being elected a Common Councilman in the year of Wilks' great row; and you may judge whether I was not astonished at finding myself in this strange country, when I only intended to do as I had often done before, go about as far as the Horns, at Highgate. However, there was no use in complaining; so out I got, blessing myself, and wondering whether I should ever get home again.

Now that I was let in for it in this strange way, I thought I might as well see a little of the world. I accordingly struck into a cross-road, and after an hour or two's walking, found myself at the village of Bramston. I am fond of *marine* prospects, Sir; many an afternoon have I

walked out on the banks of the New River, and taken my dish of tea and my mouthful of bread and butter at the Sluice House. Those who go down to the waters, you know, Sir, see wonderful things, as the parsons tell us; and here, Sir, I fell in with a grander piece of water even than the New River, that is to say, artificial water, Sir, which I always like better than natural, because there is a nice path always alongside of it; and down on the banks of the ocean people tell me there is nothing but great gravel stones to walk on. Well, Sir, this piece of water was the Grand Junction Canal. There happened to be a neat-looking public-house close to the edge of it, and so I sat myself down in the window-seat, called for a pint of beer, looked at the element before the house, and thought of Algiers, and Trafalgar, and Copenhagen, and all our other glorious victories upon the briny ocean. In the evening the landlord amused me with several choice stories and marvellous relations. Among other things, he told me of a wonderful sight, about two miles off, namely, a place called a tunnel, which is a hole dug through a great hill, and through this hole the canal goes, Sir, and all the barges on it navigate a mile and more under ground. So next morning off I went to see this extraordinary sight. What mine host told me was true enough, Sir. I saw a barge go right into the hole in the hill, and away I ran as hard as I could to get to the other end, determined if possible to see whether the same identical barge came out again safe and sound. Well, Sir, you may believe me or not, just as you like, but out it did come, the very same barge, Sir, and it looked just the same as when it went in; but the two poor men in it looked very different: when they went in they looked cool and comfortable, as any other men would on a winter's day; but when they came out they were, as Goldsmith says, "by the living jingo, all of a muck sweat."

"Why, my friends," said I, "that must be a main hot place to come through."—"The place beant hot, master, but the work is," replied they. Well, Sir, upon inquiry I found out that in this age of mechanical talent and skill, the only way in which these barges can be got through this tunnel is as follows:—A piece of plank, about five feet long, is fastened at one end to the deck of the barge by a hook, and the other end projects over the water in a horizontal position; on this plank a man lays down on his back, holding himself on as he best can, and setting his feet against the bricked side of the tunnel, thus shoves the barge along for the whole mile in length!

Now, Sir, what do you think of that for a specimen of genius and contrivance? First, we have the loss of power by the man's feet pushing against a place higher than his head, and thus shoving the boat's nose under water nearly as much as he shoves her a-head; and then we have the still greater loss by his shoving her off from the side of the tunnel, which has to be counteracted by the rudder at the other end of her. But the best joke of all, is the capital way this is of expending human life. My host, Sir, has lived there thirty years, and has seen thirty men drowned at this fun; that is, one man a year, you know, Sir—saves a good deal of emigration this.

Where I live, Sir, not far from the City, they do things better; and in many other parts I am told that in similar tunnels there are horse-paths through them. Here there is none; and formerly they had only one loose plank laid across the barges, each end projecting over the water, and upon each of which a man laid down to this work, so that if one got up without the other, the other tipped overboard directly.

Different men, Sir, are of different minds: I do not like to see my fellow-creatures drowned at this rate; other people may be pleased at it. Certainly the world must be thinned of its surplus population somehow, for, maugre Malthus, children still increase at a most desperate rate, and how they are to be got rid of is a puzzling matter in these peaceable times: the plague seems to have quitted us for ever; the cholera morbus has done no good, for less people have died, *in toto*, since we had it here than there did before;* the small-pox is dis-

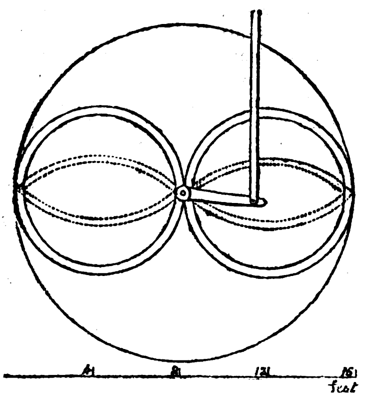
* The London Bills of Mortality tell a somewhat different story. "By a reference to them," says the *Medical Gazette*, "we find that the burials within the "Bills" exceeded those of the former year by 3,200, and that the deaths from cholera are stated to have been 3,200. It thus appears that the annual mortality has been increas[ed] almost in the direct ratio of the ravages of th[e] disease—a fact which some have altogether de[nied.] The total number of burials last year is repo[rted to] have been 28,606, being about 550 per we[ek."] Ed. M. M.

armed by Dr. Jenner; other things are disarmed by St. John Long; and by and bye we shall have nobody die at all, and be obliged to stow ourselves one upon another, like a barrel of red-herrings, for want of room to stand in. So that perhaps, Sir, it is as well that the Canal Company do drown one man a-year in this single tunnel. If in all other tunnels the same measures were only pursued, it would make up a handsome number, throughout the whole of England.

I remain, dear Sir,
Your constant reader,
ELIJAH DAPPER.

Clerkenwell, Jan. 1, 1833.

BALLISTIC FLY-WHEEL.



Sir,- -Owing to the difficulty of giving to steam a direct rotary motion, it has been found necessary, in all the applications of it that have been of advantage in practice, to apply it through the intervention of a crank, or perpetually-varying lever. In the transference of a rectilineal to a rotary motion by this means there are necessarily two dead points at which machinery would stop without the aid of some addition to the primary power. This obstacle to uniform and continued motion is effectually removed by the application, in the fly-wheel, of a vell-known mechanical principle.

On account of the necessarily immense ht of fly-wheels, it has long been a ratum in mechanics that such an ment should be made as would s to dispense with their use. neans for this purpose have, indeed, been discovered and applied; but they have been uniformly, I believe, found in practice to be attended with a cost or complexity that more than counterbalanced their real advantages. Quitting the hope of being able to remove the fly-wheel altogether, I turned my attention to the means of obviating some of its disadvantages. and it has occurred to me that by changing its construction its weight may be vastly reduced, while its peculiar power may be fully maintained.

Let us make, according to the figure, a wheel, having within its diameter two circles, consisting of hollow tubes of iron. Place in each of these circles a ball, say of lead, having perfect freedom of motion throughout its respective circle. If we suppose this wheel to be so suspended with regard to the crank that the ball of one circle shall be at the point nearest the centre, while that of the other is at the greatest distance from it, when the crank is at the dead point, it is obvious that there will be a greater power exerted at the dead point than at any other part of the semi-revolution of the great wheel. By the time the crank arrives at the other dead point, the position of the balls will be reversed, and their greater force will be again exerted in carrying it beyond that point.

It results from the construction of this wheel that it is in the nature of a perpetually-varying lever, and that while there is, on the whole, no gain or loss of power, it must in each semi-revolution act as a regularly retarding and accelerating power. At the period when the steam, in the common cylinder-engine, acts with its greatest force on the crank, the position of the balls will make the wheel a retarding power, while, as the leverage of the crank diminishes, the accelerating force of the wheel will increase. In this respect this compound wheel has neither advantage nor disadvantage compared with the common fly-wheel; like that it will regularly receive and transfer momentum to and from the crank.

Where a very rapid motion is not required, a better form of tubes for the balls to move in would be two segments of circles, as shown in the dotted lines.

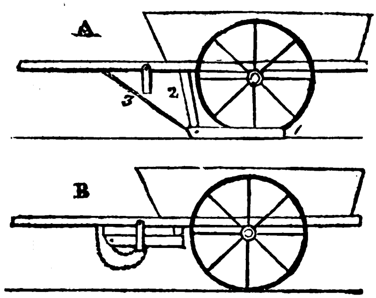
In this substitute for the common fly-wheel I conceive that a hundred pounds in weight may be substituted for almost a thousand; while there must be a considerable gain in the cost of the respective

machines from the diminished consumption of metal.

I am, Sir,
Very respectfully, &c.
J. Gorrie.

34, St. John's-square, Clerkenwell.

CARY'S CART DRAG.



Mr. Editor,—The above sketches represent a new cart drag, for which I have just received a vote of thanks from the Bath and West of England Society. I send it to you for insertion in the Mechanics' Magazine, that it may be more generally brought into use; it drags the wheel and takes the burthen off the horse's back at the same time. In fig. A 1 is the slipper, which is made larger than usual; 2 the trigger fixed to the shaft by a strong hinge, and to the slipper on which it rests by a pin through it; 3 the chain. At B the whole is doubled up, and fastens with a strap when not in use.

I am, Sir, your constant reader,
James B. Cary.

Shepton Mallett, Dec. 22, 1832.

IRISH PATENTS.

Sir,—Accept my best thanks for your prompt and satisfactory answer to my questions on patent-rights, inserted in this day's Mechanics' Magazine. Your opinions are in perfect accordance with what I supposed to be the law of the case. The questions were not imaginary, but arose out of the discussion, Beare *v.* Mallet, which lately appeared in your pages. It follows, therefore, that Mr. Beare's patent for Ireland is *invalid*, for the following among other reasons, viz.

1. That the invention was *not new*.
2. That the invention had been patented in England by *Mr. Shalders*.
3. That the patent for Ireland was taken out *by Mr. Beare* about *six years after the date of Mr. Shalders's English patent*. And,
4. That the invention had been *publicly exhibited and used* in Ireland upwards of twelve months previous to the date of the patent.

Sufficient evidence can be brought forward, as to want of originality, to invalidate the English patent; but as for the Irish patent it is an *Irish Bull*.

I therefore now repeat, what I before stated at p. 138, that any person who chooses to make the "fountain-pumps," in either of the three kingdoms, is at liberty to do so, without asking any body's permission.

When we consider the small number of "gravitating expressing-fountains" that are in use, we cannot help smiling at the simplicity of Mr. Shalders, who makes nothing of clearing out 150 *dozen of connectors* in a week or two (see p. 153). Verily the wear and tear of these same connectors is rather more than some folks would like to admit. It may perhaps be some consolation to the supposed patentees to know that the invention is not of sufficient value to be pirated to any great extent.

I remain, Sir, yours respectfully,
W. Baddeley.

London, Dec. 29, 1832.

[Mr. Beare has sent us a long letter in reply to Mr. Mallet, which reminds us of an answer to a Bill in Chancery we once read of, which, on being referred to the Master, was sent back with one half struck out because of its utter irrelevancy, and the other half because of what the lawyers call impertinence, but which, translated into every-day English, means simply not being pertinent. There is not—literally speaking—one word in it on any of the points at issue between him and Mr. Mallet. We must, therefore, decline giving it insertion; for though we hold ourselves bound to give every person attacked in our pages a fair hearing, we do not consider that our duty extends to the admission of mere wrangling on any subject.—Ed. M. M.]

INSTRUCTIONS FOR THE MANUFACTURE OF POTATO FLOUR.

Sir,—Your Magazine having lately noticed briefly the method of making po-

tato flour, I beg leave to supply some further information, having been in the practice of occasionally grinding potatos during the last sixteen years. Till within the last five years I ground them on a sheet of tin, fixed in a frame of deal, but I have now constructed a mill, by which forty or fifty bushels may be ground to a pulp in twelve hours. My former expedient, the tin, was pierced in every part with a small punch, by which it exhibited on the reverse a rough side to grind on. This simple construction is applicable to poor families. I have never tried the experiment of having bread made in part with it, and I should certainly say, potato flour is not applicable to such purpose. I have chiefly fattened pigs with it in the autumn, having at that season a great quantity of small potatos. They are first mashed, then ground in the mill, a small stream of water being allowed to run from a cask placed above, to clean the mill of the pulp. This is afterwards put into a large sieve, when, by being stirred with a brush, the black water carries the farina through. This black water no doubt contains saccharine matter, and, when the farina has settled, which requires half an hour, is put into a copper and boiled with the pulp about twenty minutes to a rich jelly, to which I add, while hot, two strikes of pollard to a boiling of pulp produced from five bushels of potatoes. This makes *excellent* food for pigs. The farina is afterwards stirred in one or two fresh waters, and passed through a lawn sieve, and when settled is taken out and dried in flat red dishes (or paper) in the sun, which renders it very fine and white, and certainly an excellent imitation of arrow root, in appearance, manner of using, and properties. If dried by a fire, or in an oven, it is equally good, but by no means so white. When I wish to fatten my pigs, I give to each, night and morning, about two pounds of the farina, stirred in a pail, with two or three quarts of boiling water, and afterwards nearly filled with cold water, to thin it sufficiently for drinking. This method, pursued a fortnight, will fatten pigs very well. A table spoonful used with skimmed milk, by gently boiling, will make a pint basin of wholesome nutritious food for children, for breakfast and supper, taken with or without sugar. To point out the potatos of most advantage to cultivate, I will lastly add, that the *best* white potatos yield only seven or eight pounds of farina, while Scotch reds will yield thirteen or fourteen pounds. The champion and red potato are the best for keeping till summer, when the sun has sufficient power to dry the farina quickly and white.

Yours, obediently,

G. L. S.

Enfield, January 3, 1833.

N.B.—The above information was sent to the Board of Agriculture twelve months back.*

CLODPOLES AND BUSHEL-PATES.

Sir,—In a recent number of the Mechanics' Magazine, there is a short article under the very complimentary title of "Clodpoles," in which the natives of "the agricultural counties of Herts, Essex, Suffolk, and Norfolk" are set down in a lump for a generation of numskulls; a fact corroborated, it appears, by the Phrenologists, who find the crania of said "clodpoles" to measure generally about half an inch less than the average dimensions of English heads.

Now, is this fact at all conclusive? Is smallness of head anything like a proof of smallness of brains? The phrenologists tell us yes; experience says no. Sir Walter Scott had a remarkably small head; and Lord Byron, we are informed by Mr. Moore, had so very diminutive a capital, that he was always sure none of his friends would exchange hats with him—for not one of them could ever get his Lordship's on! The *clodpoles*, therefore, have two tolerably good friends to bear them company in their hopeless stupidity; and if Lords and Baronets will not serve their turn, they may still find consolation in the society of one nearer their own condition—Ebenezer Elliott, the steel-breaker of Sheffield, and author of "Corn-law Rhymes," whose head, it is stated, in the last *Monthly Magazine*, is less than that of any of his children, and of course nothing equal to those of the bushel-pated northern operatives who surround him, and who, with "all appliances and means to boot" of a "large cerebral development," for which they are so highly lauded (by the worthy tribe of phrenologists) over their agricultural bre-

* We thought this Board had been extinct; it has certainly long ceased to be of any practical use.—Ed. M. M.

thren of the south, have never been able to produce any rival to Robert Bloomfield, *the Farmer's Boy of Suffolk!* an "agriculturist," born and bred in one of the very four counties condemned in the "clodpole" paragraph to intellectual darkness!-! Now that we have a manufacturing Bloomfield, he happens—oh! woe to the wise!—to be distinguished from his fellows by a smallness of head, generally only to be met with in the most Bœotian agricultural county!

It is now a sort of fashion to take it for granted (though Adam Smith is of the contrary opinion) that manufacturing districts possess more intellect than agricultural: yet it would puzzle the supporters of the popular idea to produce two natives of the former equal in intellect to Locke and Newton, both of whom were born in agricultural counties.

Yours, respectfully,
NO CLODPOLE.

January 4, 1833.

COMPRESSION OF GAS AND LIQUEFACTION OF AIR.

Sir,—The observations of Mr. Rutter, in your last Number (Dec. 29), remind me of my own experiments in the compression of air and gas. The same appearances which he describes presented themselves to my notice, but I always considered that the re-flow of gas or *water*, on opening the stop-cocks, arose from a gradual return of the vessel to its original bulk and form, and not from any peculiar and hitherto unobserved property in the condensed substances, as Mr. Rutter supposes. The elasticity of the metal is put to so severe a trial that it does not suddenly, if ever, go back precisely to its former state; and it is worth observation whether a succession of such trials would not ultimately occasion a rupture: though found to be proof in the first instance, it certainly would with a metal of inferior elasticity.

With regard to the use of separate vessels for the gases, I have an indistinct recollection that Dr. Clark adopted this plan, but failed in producing those brilliant results which he afterwards obtained with his blowpipe and reservoir of mixed gas.

Mr. Rutter asks, "may we not expect to see air liquefied?" It cannot be said to be impossible, nor very improbable; but that the experiments of Mr. Perkins have decided the question in the affirmative may be confidently denied. They did not justify the inference which he drew from them: his apparatus, in fact, was inadequate to the purpose.

I am, Sir, &c.,
BEN. CHEVERTON.

NEW PUBLICATIONS CONNECTED WITH THE ARTS AND SCIENCES.

Practical Observations on Gas-Lighting. By J. O. N. RUTTER. 52 pp. 12mo. Longman and Co.

We can imagine nothing better calculated than this cheap and little treatise to make the economical practice of lighting by gas universal throughout the country. The gas-works hitherto erected have been chiefly confined to large towns; the purpose of this well-timed production is to show that there is not a town or village, whose population amounts to 2500 or 3000, where such a manufactory may not be established, with equal advantage to the poprietary and to their customers. Mr. Rutter states in detail what has been done in this way at Lymington, in Hampshire, a town of about 700 houses and 3357 inhabitants; and taking the positive facts furnished by that case for his groundwork, presents us with estimates for all towns of like magnitude. His calculations are the more deserving of confidence, that the Lymington Gas Company displays, both in its formation and management, a more than ordinary degree of judgment and prudence, and that Mr. R. himself appears to have been one of its most active promoters. We feel satisfied that no body of persons projecting the establishment of a Gas Company could have recourse to a safer or more useful guide. A great deal of practical information of the first importance is embodied in the treatise, and communicated in an extremely clear and intelligible style.

Humanity to Honey-Bees, or Practical Directions for the Management of Honey-Bees upon an Improved and Humane Plan; by which the Lives of Bees may be Preserved, and Abundance of Honey of a Superior Quality may be obtained. By THOMAS NUTT. 240 pp. 12mo. Wisbeach.

Several papers have appeared in this Journal on the subject of Mr. Nutt's im-

provements in the management of the honey-bee—some from Mr. Nutt himself—but it has been a matter of general complaint with our apiarian correspondents, that they still left the nature of these improvements involved in a considerable degree of obscurity. We have great pleasure, therefore, in now acquainting them that Mr. Nutt's long-promised book on the subject has at length made its appearance, and is, as far as we—who are no bee-masters—are able to judge, well calculated to clear up all doubts as to the reality of the author's claims to be considered as one of the greatest benefactors of this humble but eminently useful and interesting order of labourers who have yet appeared. The book is very well written; the arrangement of the contents methodical and distinct; the explanations clear, frank, and unreserved; and the sentiments interspersed equally distinguished for benevolence and good sense. Nor will it lower Mr. Nutt in the good opinion of his readers—although it may detract somewhat from his literary pretensions—that he honestly acknowledges that the book would never have been what it is, but for the liberal assistance he has received in its preparation from one of his most skilful apiarian pupils, the Rev. J. Clark, of Gedney Hill, who "revised, corrected, and arranged the materials of which it is composed, and has, moreover, gratuitously added much that is original and valuable from his own rich stores of knowledge."

The circumstances which first led Mr. Nutt to direct his attention to the management of bees, and gave rise to his "improved system," are of a more than usually interesting kind, and related, we think, in a very natural manner:—

"To theory I lay no claim. Born and brought up in the fens of Lincolnshire—where I have spent the greater part of my life amidst difficulties, misfortunes, and hardships, of which I will not here complain, though I am still smarting under the effects of some of them—my pretensions to learning are but small; for though sent to the respectable grammar-school at Horncastle in my boyhood, my education was not extended beyond writing, arithmetic, and merchants' accounts. As soon as it was thought I had acquired a competent knowledge of these useful branches of education, it was my lot to be bound apprentice to learn the trades and mysteries of grocer, draper, and tallow-chandler. Whilst endeavouring to gain an honest livelihood as a grocer and draper at Moulton Chapel, in 1822, I was afflicted with a severe illness, which, after long-protracted suffering, left me as helpless as a child, the natural use and strength of my limbs being gone; and though supported by and tottering between my crutches, it was a long time before I was able to crawl into my garden. Fatigued and exhausted with the exercise of journeying the length of a garden-walk of no great extent, it was my custom to rest my wearied limbs upon a bench placed near my bees. Seated on that bench, I used to while away the lingering hours as best I could, ruminating now on this subject, now on that, just as my fancy chanced to fix. Among other things my bees one day caught my attention; I watched their busy movements—their activity pleased me—their humming noise, long listened to, became music to my ears, and I often fancied that I heard it afterwards when I was away from them. In short, I became fond of them and their company, and visited them as often as the weather and my feebleness would permit. When kept from them a day or two, I felt uneasy and less comfortable than when I could get to them. The swarming season arrived, and with it ideas took possession of my mind which had not until then possessed it: I conceived that swarming was an act more of necessity than choice—that as such it was an evil; but how to provide a remedy for it—how to prevent it, was a problem that puzzled me. I studied it for a long time, and to very little purpose. The old-fashioned method of eking did not by any means satisfy my mind; it might answer the purpose for one season, but how to proceed the next did not appear. Then the time for taking honey was approaching: to get at that treasure, without destroying my little friends that had collected it, and that had, moreover, so often soothed me in my sorrow and my sufferings, was another problem that long engaged my mind. After some years' unremitted attention to my bees—for I had formed a sort of attachment for them, during the first stage of my convalescence, which never left me—an accident aided my studies, by directing my attention to the effects of ventilation (as will be found related in the body of this work), and I began to make experiments, which being repeated, varied, improved, and then gone through again, have gradually led to the developement of my improved mode of bee management, attempted to be explained in the following pages. At the time I have been speaking of I had not read one single book on bees; nor had I then one

in my possession. Whatever my practice may be, it has resulted from my own unaided experience and discoveries. To books I am not indebted for any part of it; nay, had I begun to attempt to improve the system of bee management by books, I verily believe I never should have improved it at all, nor have made one useful discovery. *The bees themselves have been my instructors.*"—Preface.

The principal improvements which Mr. Nutt professes to have accomplished in bee management are these:—1st. How to obtain from bees honey of the very purest quality, and in more considerable quantities than heretofore, without having recourse to the barbarous method of suffocation, or any other violent means whatever. 2. How all the bees may be preserved uninjured. And, 3. How swarming may be prevented.

The accomplishment of these important ends depends mainly on a new mode of constructing the bee-hives, which Mr. Nutt calls the *collateral* method—in contradistinction apparently to the storifying plan, which has of late years been so much in vogue. According to the storifying system, as soon as one box is filled with comb, it is placed on the top of a second one in an empty state, which, on being filled in its turn, is placed on the top of the first, and so on; but according to the collateral system, every requisite extension of room is obtained by means of three boxes, placed side by side on one stage, in the manner represented in the engraving of the apiary at Hornby Castle, given in this Journal for July 16, 1831. The chief disadvantage ascribed by Mr. Nutt to the storifying system is, that it makes no provision for the separate labours of the queen bee and working bees. "The brood-cells are intermixed with those containing honey—wreaths of pollen are in every pile—and animated nature is every where peeping from the waxen cells, in which nothing but pure honey should have been deposited." Another objection is, the great waste of labour, and consequent diminution of produce, attending the storifying system; the extent of which drawbacks Mr. Nutt very aptly illustrates by asking which a person would prefer—to "set down a heavy load on a ground-floor, or tug it up two or three long flights of stairs, and through intricate winding passages, and be jostled, and impeded, and pushed about, and perhaps backward, every now and then, by countless crowds of busy men, unceasingly hurrying up and down, and passing and repassing the burdened man in every direction?" A third and still more important objection is, that when at length the storied boxes are filled, no honey can be obtained from any of them without the destruction of a great number of bees, and sometimes not without the loss of the entire swarm. By the collateral system all these evils appear to be completely obviated. A complete hive on this plan consists, as we have said, of three boxes; but it is to be observed, that the centre box is surmounted by a bell-glass (see the engraving of the Hornby Castle Apiary), which may be considered as serving the part of a fourth box. Between these four compartments there are convenient channels of communication, which the bee-master has it in his power to shut or open as he finds expedient, by means of moveable slides. The bees are first introduced into the centre box, or pavilion, as Mr. Nutt calls it, in the same way as an ordinary cottage-hive is stocked, and the apertures to all the other chambers are closed. As soon as this box is filled, and the bees are preparing, from want of room, to swarm—which may be known by an unusual noise and stir in the little community—the slide which commands the entrance to the bell-glass at top is withdrawn, when the bees speedily take possession in great numbers of the new chamber thus opened to them, and proceed without delay to continue their works upwards. When the glass is nearly filled, one of the side boxes is next opened, and when that also is filled, the same course is followed with the other. The queen bee, it appears, makes the pavilion, or centre box, her permanent place of abode, and leaves the other chambers free to the working-bees; and hence there is no intermixture of the business of the nursery (so to speak) and the workshop. For this Mr. Nutt gives the following satisfactory reasons:—

"The Queen wants a certain situation in which to carry on the work of propagating her species. Like the fowls of the air, she will not, if she can avoid it, propagate her young whilst under the observation and influence of man; she therefore prefers the middle box for her work of propagation, as well on account of its privacy, as because the ventilation of the end boxes so cools their temperature that they are not the situation nature requires

to bring the young larvæ to perfection; yet they can be kept at such a temperature as to make them desirable store-rooms for their treasures."—p. 38.

The "ventilation" of the side boxes, which Mr. Nutt here speaks of, is effected by perforated tin cylinders placed on the top of each, with caps to exclude the wind and rain.

When the bell-glass and side boxes are all filled—what next takes place? The remainder of the process—the most interesting perhaps of the whole—we shall leave Mr. Nutt to describe in his own words:—

"No sooner have the bees finished their operations in the several compartments of their box hive—which may be ascertained by looking through the little windows at the back and ends of the boxes, than the bee-master gently puts in the tin slide, lifts up the lid of the octagon cover, takes off the bell-glass, filled with the purest and most perfect honey. Before however, he endeavours to take away the glass, it is quite necessary that he should cut through between the bell-glass and the box with a fine wire, in order that the tin may the more easily slide under the full glass of honey; when this is done, he may take off the full glass, and replace it with an empty one. He must then draw out the tin slide—and so on for ever. The operation of taking off a glass or a box of honey, may be best performed in the middle of a fine sunny day; and in taking off a glass, the operator, having put in the tin slide as already directed, should wait a few minutes to see whether the bees made prisoners in the bell-glass show any symptoms of uneasiness; because if they do not, it may be concluded that the queen bee is amongst them; and in that case it is advisable to withdraw the slide, and to recommence the operation another day. But if, as it generally happens, the prisoners in the glass should run about in confusion and restlessness, and manifest signs of great uneasiness, then the operator may conclude that all is right; and having taken off the octagon cover may envelope the glass in a silk handkerchief or dark cloth, so as to exclude the light, remove it with a steady hand, and place it on one side, so that the bees may have egress from it, in some shady place, ten or fifteen yards from the boxes, and the bees that were imprisoned in it will in a very few minutes effect their escape, and return with eagerness to the pavilion and their comrades. * * * You will then remain in possession of a box of honey, and all your bees will be in safety, harmonising with their beloved parent—the queen of the hive. Take from them the box your humanity entitles you to, minding that the tin slide is safe to the middle box. You will then empty the full box, and return it empty to its former place; then draw up your tin, and you again enlarge their domicile, having regained a net reward for your operation at the expense of their labour. A child of twelve years of age may be taught to do this, without the least danger: there need no bee dresses—there needs no fumigation of any sort. It is a natural movement for the welfare of these worthies that prevents their swarming, and at once secures to the sovereign queen of bees her rightful throne."—pp. 38—42.

Is there really, then, never any swarming at all under Mr. Nutt's system? Never any surplus of labourers to be provided for by emigration? Does the population of the hive, when it has reached the point of sufficiency, stop there precisely, and neither advance nor recede? We must say frankly, in answer to these questions, that they are by no means satisfactorily met by any thing in Mr. Nutt's book. We can see how, by his system, pure honey can be obtained, and more of it than heretofore (his 1st position); how also a great many bees may be saved from wanton destruction (his 2d position); but we do not see how he prevents that swarming (his 3d position) which must be the result of any excess of population—and on general principles we think such an excess must ultimately take place in the collateral as well as in every other sort of hive. Mr. Nutt does point out (p. 43) how occasional swarms may be disposed of; but it is of swarms arising only "from the negligence, or unskilfulness, or unavoidable absence of the bee-master at a critical time," that he speaks. It is to be inferred from this, that, according to Mr. Nutt, if bee-masters would only be careful and clever enough, such a thing as a swarm would never be heard of. Mr. N. observes elsewhere (p. 170) that "bees do increase and multiply at a prodigious rate;" but he adds, "the only question to be solved is this—How is the queen bee impregnated?" Now, with all deference to Mr. Nutt, there is another question of equal importance to be solved, which is this—How is the "prodigious" increase, which is the result of the impregnation, to be provided for? Or, at all events, how is it to be prevent-

ed? Mr. Nutt has not left us without a practical solution of his own of the difficulty, and, such as it is, we shall lay it before our readers:—

"There is but one reigning queen in a colony of bees at one time; but previously to swarming, royal cells are constructed, and provision made for ensuring a successor to the queen that leads the swarm and emigrates (Mr. N. maintains it is *always* the *old* queen that emigrates), when the too crowded population and overheated temperature of the hive render such emigration necessary. * * In general there are several of these royal cells, containing embryo queens in different states of forwardness; so that it seems bees have an instinctive foresight which leads them to provide against casualties, for they are generally provided with the means of bringing forth *supernumerary queens*, so that in case the first that comes forth should prove sterile, &c. * * But no sooner is a young queen enthroned, as it were, and established in the government of the hive, than the *supernumerary* ones, in whatever stage of existence, are all discarded, and cast out of the colony. * * I myself have observed no fewer than twenty-four supernumerary virgin queens that were cast out of my stock, and that stock is flourishing and has not swarmed. * * Ventilation, and the means of dividing the treasures of the bees, by taking off a glass or a box of honey, or, if necessary, by taking off both a box and a glass, *set aside the necessity for swarming*. On all occasions, under this practice, a proper temperature may be supported in a colony; and in all critical points, by a just observation of the state of the thermometer, bees may be relieved and assisted, and all the mischiefs attending the old mode of management may be guarded against and prevented; for when adequately relieved, and properly assisted, they proceed to rid the colony of all embryo queens, which would only become so many supernumeraries in a hive, where the reigning queen is fertile, and the necessity for emigration is superseded. But unless bees could be made to understand that accommodation will be extended to them at the proper time, they, guided by *their* sense of their situation — not by ours — naturally and wisely provide *their own means* of relieving themselves; and in so doing, frequently bring forth what afterwards become supernumerary queens, which are invariably destroyed and cast out of the colony, as soon as the bees are sensible that they have no occasion for them. And whenever a royal nymph or a virgin queen is thus cast out, *swarming need not be apprehended*."—pp. 179, 180.

It will be seen from this that Mr. N. very seriously of opinion, that bees, when placed under such circumstances as he contrived for them, will of their own accord, and after well-considered calculations of supply and demand, invariably destroy as many of their brood queens as shall keep the numbers of the colony exactly at that point which is just enough and no more. Now, this is so contrary to the ordinary course of nature, in every other animated tribe with which we are acquainted, that no person can be expected to believe it, except on evidence of the fullest and most undeniable description. Not any number of such insulated instances of virgin destruction as Mr. Nutt has cited will suffice to establish so anomalous and extraordinary a law. We must see how it is borne out by the history of one entire colony for a series of years—by a comparison of its numbers at the beginning with its numbers at the end of the period, and at different intermediate stages—by a comparison. too, of the annual mortality from natural and artificial causes with the annual increase; nay, we must have not merely one such history, but a great many such histories, and be able to deduce from the whole a clear and irrefragable confirmation of Mr. Nutt's singular theory before we can safely subscribe to it. Now, Mr. Nutt has furnished us as yet, with nothing of the kind. We do not say that his theory may not be true; for the economy of bees is altogether such a volume of wonders, and the manner of their propagation still involved in so much mystery, that the mind is prepared to credit almost any thing respecting them. We question merely the sufficiency of the evidence on which it is for the present founded. Should Mr. Nutt turn out to be in the right, he will have furnished a certain class of our political economists with a case in point, for which they can never be sufficiently grateful to him. We allude to that very philosophical order of State tinkers, who imagine that they can stop by artificial checks the general course of nature—and who make no more to do about damming up the flood of life than turning aside an eave's dropping. To all the scorn and derision with which they may be henceforth assailed they have only to reply—Are we not commanded by the Sacred Writings to go to the bee and to the ant and learn wisdom? And has

not the famous Mr. Nutt proved that it is the practice of the bees, whenever their numbers are getting in excess, to check the evil at the fountain head—to seize upon the would-be parents when in embryo, and cast them out from amongst them?

We must observe, before leaving this part of the subject, that if a colony of bees is only to be prevented from swarming by such a destruction of embryo queens as Mr. Nutt claims allowance for, a considerable deduction must in fairness be made on this account from the merits of his system, so far as it professes to "preserve all the bees uninjured." The saving of living swarms of able-bodied labourers from the fumes of brimstone, cannot be said to be an entire gain, as long as it can only be effected by another Massacre of Innocents,—albeit in embryo.

The sketch which we have here given of Mr. N.'s system embraces, of course, only its more general features; but the length to which this notice has run compels us to refer our readers to the work itself for a great many subordinate details—some of them of a very novel, and all of them apparently of a most instructive description. We regret this the less since the work is certainly one which no zealous apiarian will be long without. The chapters on the temperature proper for bees, and on the necessity of a regular ventilation of the hives, will be found particularly deserving of attention.

The book is inscribed, in a very pleasant dedication, to the Queen of the B——s; not, however, her of whom the author treats so largely in the work, but "Her Most Gracious Majesty Queen Adelaide, Queen of the Britons."

IRON VASES, &c.—Sir,—Observing an inquiry in your Magazine (Dec. 29, 1832,) respecting where iron vases, &c. might be obtained, I beg leave to state, that I have seen several very elegant castings from the antique vases at Messrs. Cottam and Hallen's agricultural repository, Winsley street, Oxford-street, which appear in every respect to answer the description of your correspondent.—I remain, Sir, yours obediently, G. H. P.

Note to the Article "On Reclaiming Land from Rivers."—In p. 228, it is stated, that the Po is so much raised as to be of the nature of an aqueduct carried above the adjoining lands, and from the context it would seem that this elevation was caused by cross-weirs. Those readers who are acquainted with that splendid river, will of course know that this is impossible. The fact is, the passage respecting the Po was intended as an illustration of the rapid growth of banks, and should be introduced where line 39, in col. 1, p. 228, begins.—Lincoln's Inn, Jan. 8, 1833. M.

More of the late Earthquake.—It appears from the Welch papers, that the shock felt at Swansea on the night of Friday the 28th Dec., was also more or less felt along the whole of the coast to the westward of that port; that a second shock was felt there about half-past seven on the morning of Saturday, Dec. 29; and that a third, much severer than either of the preceding, caused general alarm at Swansea, Neath, Llandovery, Newport, &c., on the morning of Sunday, Dec. 30. The barometer in the last instance was at 30; the thermometer about 40; but the mercury did not appear to be much affected in either of the instruments by the shock. The sea is stated to have receded at the moment in an unusual manner. It is worthy of remark, that the great earthquake which destroyed Lisbon on November 1, 1775, was felt at Swansea more than in any other part of Great Britain. We shall not be surprised, therefore, to hear soon of some similar catastrophe having recently occurred in the South of Europe.

African Colony of Liberia.—"Vindex" has, "in the absence of the daily-expected communication from Mr. Cresson," in answer to F. H.'s "Note worth Notice," on the American Colonisation Society, sent us a late number of the *Sunderland Herald*, in which there is an account of a public meeting held in Monkwearmouth Church, David Barclay, Esq. in the Chair, at which resolutions were passed, approving in the most unqualified terms of "the plans and principles of our American brethren, in the formation of the Christian and independent state of Liberia."

Love of Smoke.—Mr. Loudon, in the last Number of his excellent Encyc. of Cottage, Farm, and Villa Architecture, states that in most parts of the Highlands of Scotland, peat fuel is so abundant, and the people so attached to peat smoke, that when new houses, built of stone and lime, with chimneys to carry off the smoke, were introduced on the Marquis of Stafford's estates, many of the farmers refused to live in them, and it took years before others could be reconciled to the clean and cold appearance which they alleged was produced by the want of smoke."

INTERIM NOTICES.

☞ ***The office of the Mechanics' Magazine will be removed, next publication day, to No. 6, Peterborough Court (between Nos. 135 and 136, Fleet-street), where all communications, after tha date, are requested to be addressed.***

Communications received from Mr. Rutter—Mr. Robson—Aquarius—O. P. Q.—J. S.

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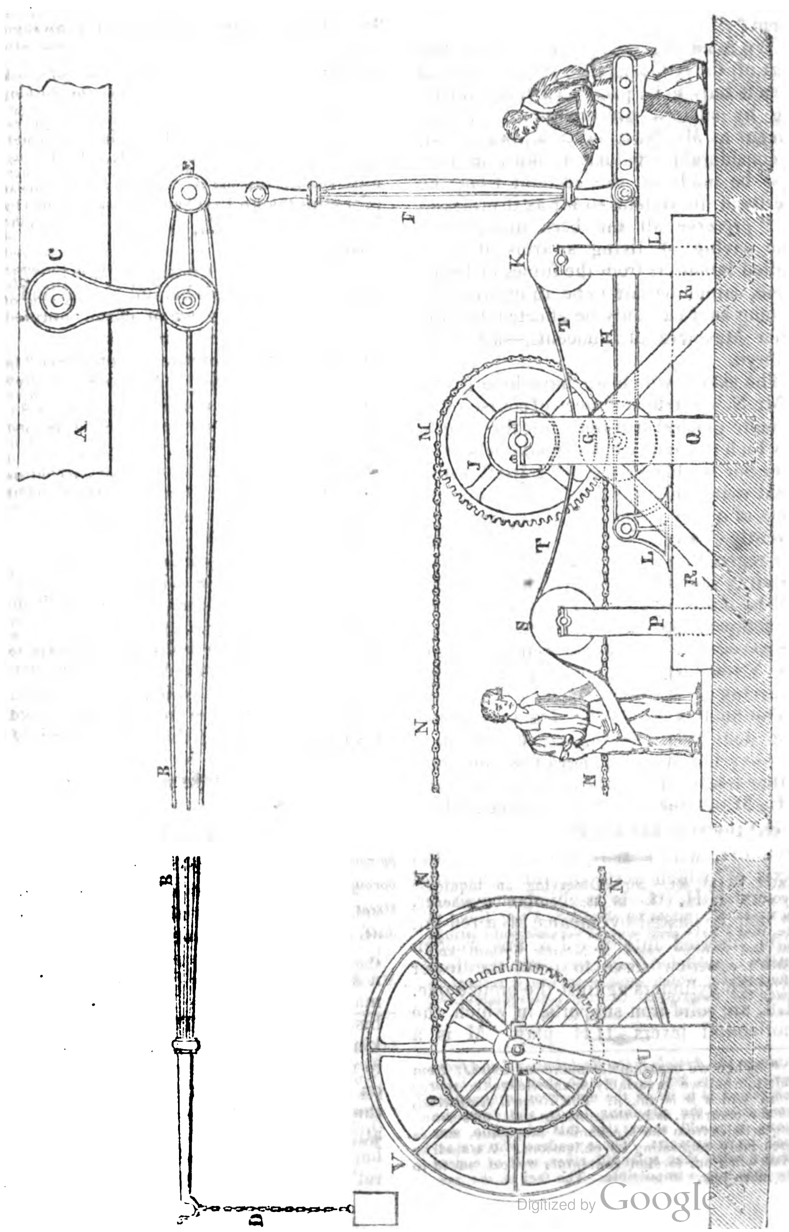
FRENCH MACHINE FOR WATERING SILKS.

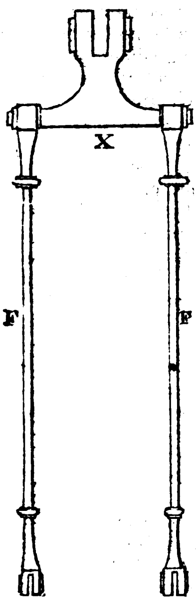


FRENCH MACHINE FOR WATERING SILKS.

We extract from the last Number of the *Recueil Industriel** the following description of the machine made use of at Lyons to water (*pour moirer*) silk stuffs.

A, fig. 1, (see front page) represents part of a solid beam, to which is fixed the lever B, by means of a strong iron hoop, C. D is a chain or cord, attached to the end of the lever, and from which a weight is suspended. E E are iron links, which turn on pins, and sustain a solid iron cross-head X (fig. 2), to which are

Fig. 2.



fixed the two levers F F. G is a wooden cylinder, with a sculptured surface, the axis of which rests on the horizontal levers H H. I is a bronze cylinder, which is heated by means of a red-hot iron inserted into it. J K are wooden rollers, which serve to press the lower wooden cylinders against the bronze one. L L are solid iron supports, in which the horizontal levers H H play. M is a wheel of iron or wood, three feet in diameter, fixed to one end of the bronze cylinder I, which it turns slowly round. N N is a chain, which turns the wheel M. O is a toothed wheel, three feet in diameter, round which passes the chain N. This wheel is fixed to the great wooden wheel V, which may be turned by the handle U, or any other adequate moving power. P Q are strong wooden pillars for supporting the wheels and the cylinders. R R is a block of hewn stone, eighteen inches high, four feet long and four thick, for supporting the apparatus of cylinders and levers by means of the iron supports L L, which are firmly rivetted into it.

The manner of working is this:—One dresser is stationed behind the cylinder R, on which the piece of cloth, doubled lengthwise, is rolled; and his business is to pass this cloth by the one end between the two cylinders. Another dresser, placed behind the cylinder S, receives the end of the cloth so passed through, and draws it upon that cylinder, which is pressed against the bronze one, by hanging to the lever D a suitable weight, and then putting the apparatus in motion. The piece T, as it unrols, passes between the two cylinders G and I, and rolls itself on to the cylinder S.

To obtain a watered ground with designs they employ a cylinder of walnut wood engraved in hollow; for watered designs on plain grounds they use a cylinder, the designs on which are in relief.

The cylinders are from seven to eight inches in diameter; the bronze one is as much as four feet long. The ordinary cost of watering silks is from five to six sous the ell.

* When we occasionally make an extract from this journal we invariably acknowledge the source from which it is taken. The *Recueil Industriel*, on the contrary, is in the constant habit of borrowing articles from the Mechanics' Magazine, and as invariably concealing its obligations. We shall be glad when our foreign contemporary can afford to be more just.

THE DRY ROT.

Sir,—I have read with great interest your extracts from "Mr. Mudie's Theory of the Dry Rot;" but though I acknowledge it to evince great acuteness, I cannot entirely agree with it, for there are many facts which he has not taken into his consideration. The tendency of one kind of timber to rot, and of another kind to remain sound, seems to me to depend on the chemical composition, much more than on the organic construction or formation. The fungus which grows on timber (in what is called the state of "dry rot") is very properly shown by Mr.

Mudie to be an effect, and not an original cause, of decay, though afterwards assisting in the work of destruction. Some metals decompose very rapidly in atmospheric air, and are partially protected by immersion in water. This is the case also with different varieties of woods. Every physical substance, whether natural or artificial, animate or inanimate, so far as our knowledge goes, is soluble into gases and metals. In natural bodies the component parts will be found to consist of those gases and metals which have a great affinity for each other; but if they be brought in contact with other substances for which they have a greater affinity, they decompose, and form new compounds. Thus some rocks, exposed to the atmosphere, disintegrate, and form clay. Others, again, which are soft in the quarry, harden by exposure to the atmosphere. Metallic iron, exposed to the atmosphere, absorbs oxygen and becomes rust, in which state it can be absorbed either by trees or animals, while growing. The dry rot in wood may be caused either by animalculæ, or by destructive chemical affinity. If by the former, the inducement may be either the desire of propagation, like flies when they deposit eggs or maggots in flesh, or it may be that the wood contains sugary or nutrimentitious particles, fitted for their food. If the dry rot be caused by chemical affinity, it is a proof that there is something in the atmosphere against which it requires protection. Whether the attack be animal or chemical, the remedy, to be effective, must be chemical. The mechanical operation of covering the outside with paint is not sufficient. That the chemical remedy is efficient, has been proved by the successful experiments of Mr. Kyan with corrosive sublimate, and of M. Breant with saline, oily, and resinous matters. It is therefore clear to me, that the durability of woods is a matter for the experiments of the chemist; and it is not improbable that increased knowledge in the art of properly preparing woods will ultimately render woods which are at present considered useless, as durable as those which are esteemed more valuable. Mr. Mudie states that "carbon and astringency are the things in which perishable oak timber is deficient." They are both antiseptics, and it is probable that the same substance which prevents animal fibre from putrifying will be found available for the same purpose in vegetable fibre. In underground positions, where timber is found durable, carbonic acid is mostly in abundance; and in the peat mosses, where astringency is found, the "bog timber" which is dug up is scarcely destructible by time. But the timber which has lain for ages under water soon decays on exposure to the atmosphere; that is to say, it meets with some substance for which one or more of its component parts possesses a chemical affinity, and decomposition takes place,—just as a lump of calcined limestone falls to pieces on coming in contact with water.

There can be no doubt that light is an important ingredient in the germination of plants; and it must be clear that plants which are badly germinated can never thrive so well as those which are healthy from the beginning. Consequently, the seed taken from inferior trees will not produce perfect trees; just as the child of unhealthy parents, though he may be improved by good treatment, can never equal one who is born of parents physically perfect, and trained in the same manner. But I incline to think, that though light be an absolute necessary, soil is no less so. From light and air the tree gets health and strength—the vital principle, if I may so phrase it; but from the soil it must get its material, and it is upon this material that the quality of the timber depends. I have understood that plants which are grown in darkness, if they are also dried in darkness, are not combustible *per se;* they will burn in a fire, but not furnish combustible fuel. I do not *know* this, and should like it to be contradicted if it be not so. There are two species of mahogany brought to England, which are known under the name of Honduras and Spanish. The former is a soft and comparatively light wood, easily wrought, and of not very slow growth. It is produced, I have understood, on light alluvial soils of various parts of the Spanish Main, and some of the very softest kind near swamps. The Spanish mahogany, on the contrary, is principally brought from the West India islands, and grows in the rocky ravines and cockpits, where it roots itself in the crevices of the limestone rocks with but little soil. The wood is hard and knotty, and very heavy. It can only be wrought with a toothing-

plaine, as the pores are filled with a whitish substance, which is, I believe, lime and silex. The soft Honduras wood is liable to be pierced by worms; the hard Spanish never is. The trees are, I believe, of the same class and order, the climate is nearly the same, and they are alike planted by the hand of Nature: therefore, in this case, the soil must be the cause of the difference. The Spanish is a tree of slow growth, and, like many other trees, is disappearing before the presence of man, who likes only to encourage rapid production. It will always be found, I believe, that the hard woods are of slow growth, and are produced on hard soils. The more exposed they are to the air, the harder and tougher do they become; and they are, for the most part, as capable of being acclimated as man himself. American oak and American pine are two species of woods known to all the world as subject to very rapid decay. The ordinary American vessels are not expected to last more than six or seven years; and I think the vessels of the packet lines between New York and Liverpool are degraded into a less important service after four or five years. Now, it will be found upon examination, that both these kinds of timber are produced upon alluvial soils, or in the neighbourhood of water-courses. They are not the produce of rocky or clayey districts, and, contrary to the statement of Mr. Mudie, they moreover grow closer together than is desirable for health, spiring up to a great height, and causing that peculiar shade which distinguishes the American forest from the forests of mountainous countries. It is by no means improbable that the habit of dwelling for ages amidst such a gloom may have been one cause of that absence of joyous temperament peculiar to the race of Red Indians. Year after year these trees shed their leaves, and occasionally add their trunks, dead of old age, to the mass of rotten vegetation, forming a peculiar mould of great richness and considerable thickness, which gives a fresh stimulus to every succeeding crop of trees, and is never swept away by searching winds, which can gain no entrance through the impenetrable barrier of the living stockade, but sigh mournfully over the thickly-matted leafy roof. It is in the flocculent surface of the accumulated vegetable dust of ages that the red warrior leaves the print of his foot as he glides through the forest, and thus enables a hostile tribe to follow up the "trail" and deal forth sudden destruction. It is on such land, when a ring is cleared of its forest load by the axe of the squatter, that the heavy crops of corn are reaped which cause the natives of long tilled lands to lift up their eyes in incredulity when they are told of them.

But there is another kind of American oak, which is called "live oak," which is of all but eternal duration. In the appearance of the grain of the wood it is not unlike the wood known by cabinet-makers as "Botany Bay oak," save that, in lieu of the red-coloured elliptic veins, there are small cavities of a similar shape. The wood is as hard as lignum vitæ. This timber is not subject to the dry rot, but it has become very scarce, so much so, that on all public lands the Government of the United States have reserved it for the use of the navy. I have been informed that this species of oak grows only on the hard clay ridges of the South. Throughout America I never heard of timber trees being artificially cultivated, and it is very probable that the scarcer species, of slow growth, will in time become extinct. In the large and deep ravines of the marine ridge of mountains, in the neighbourhood of Quillota, in Chile, there grows in abundance a species of tree called *Vellota*, which bears a fruit somewhat resembling an acorn. Its general appearance is that of an oak, though with differently formed leaves, and the grain and colour of the wood much resembles ash, but it is as hard and solid as the box, or the dense wood of the cork-oak of Spain and Portugal. These trees grow in the moist ground of the ravines, and overshadow the water-courses to the height of fifty feet, and are from two feet to three feet in diameter near the butt. The fishermen form their canoes from them, and in the salt water they will last any length of time; but in a dry situation, as the timbering of a house, the wood will become worm-eaten and useless in the space of two or three years. In the fallen and decayed trunks lying near the water-courses, I have seen worms, white, fat, and in great abundance, from four to five inches in length, and half an inch in diameter. Saturation, with any substance poisonous to the worms, would make this

timber durable. In most parts of Chile, and also on the eastern side of the Andes, there is to be found in considerable abundance a tree called the *Algarrova*, or Carob, which varies in size, according to the places where it is grown, up to twenty-five feet in height, and two feet in thickness. The leaves are fibrous, like those of the pine. The wood is darker coloured than mahogany, and exceedingly hard and heavy. In some districts it is used for fences. The trees are cut into lengths of eight feet, and planted side by side, close together, in a trench, when the earth is rammed close upon them. Some of these fences are two hundred years old, and, though constantly exposed to "wet and dry," are still as sound as when they were new. The leaves, green or dry, are excellent food for cattle. The pods, which resemble French beans in their shape, and are very abundant, serve to make bread, and also an intoxicating beverage. The long and solid thorns serve for nails for boxes of soft wood. The shade of the wide-spreading branches is most agreeable. The wood makes excellent charcoal, as dense as coal, and capital agricultural instruments. The ground which this tree seems to prefer, naturally, is rocky and sandy, with much disintegrated granite. But it will also grow in alluvial ground, near water-courses; but, though it increases in size, it loses much of its solidity. The *Espino* is another tree, of the same kind and qualities, which likes hard clay land, and is remarkable for its golden-coloured and delicious aromatic blossoms. The result of my experience is, that hard and solid woods are almost invariably produced on clayey, rocky, or sandy grounds; and that the softer and less durable woods are produced on soft and alluvial grounds, constantly kept in a moist condition, and this without regard to difference of temperature. I have remarked, also, that on the hard soils the trees never grow closely together, as they do in swamps.

There is another class of trees remarkable for their soft wood, which are, notwithstanding, very durable. I allude to the pines and cedars, at least some species of them. They are not proof against decomposition by "wet and dry," but are so against the attacks of worms. The giant red cedar, called *Alerce*, which grows in some parts of the Southern Andes, and near Valdivia, in Chile, is never touched by the worm, its astringent principle probably preserving it. This tree grows to the height of eighty feet, and about three feet in diameter. It would make a most valuable import to England, in seed, to stock plantations. The grain of the wood is straight from end to end, and boards are rent from it, as laths are rent in England. The aromatic scent of cedar wood is known to keep moths away, and it is perhaps on the same principle that worms refuse to attack this wood. It is somewhat remarkable that the red and dark coloured woods belong to the durable species, whether hard or soft. Thus, the hard *Vellota* is rapidly destroyed by the worm; and the soft *Alerce*, which is not one-fifth of its weight, is impervious. It is probable that saturating the *Vellota* with astringency would render it durable. Mr. Kyan's experiment with the corrosive sublimate, to prevent canvass from rotting, would seem to argue that living beings were the destroyers, whose agency is stopped by poison.

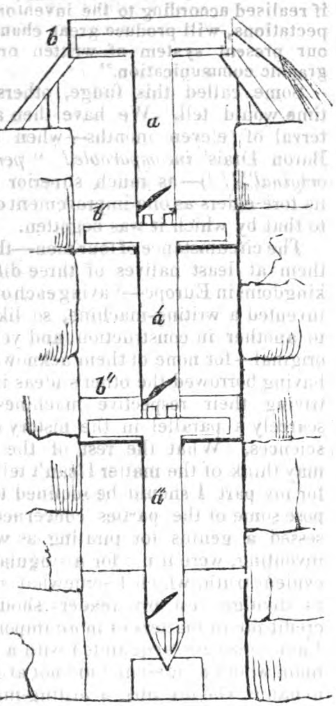
When shall we get through the slough of politics, and procure the establishment of a college of chemistry, to pursue national objects with united science and method? We are still in our infancy in much that tends to the happiness of man.

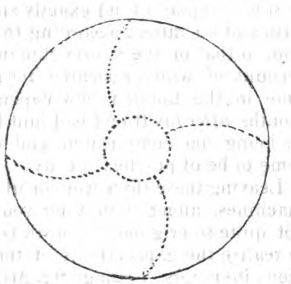
After all, I do not care much about timber trees, as a material; for we have an abundant stock of metals, which may be far better adapted to the various purposes for which timber has hitherto been used. Not that I by any means overlook the value of trees; but it is as objects of extreme beauty that I regard them. I feel a reverence for every portion of the glorious vegetable world, and would not willingly crush a flower with a too hasty foot. Even the smoked "scarlet runners," which wind up packthreads around the windows of the poor in gloomy cities, have for me an inexpressible charm. Are they not an evidence of the embryo love of a garden which appears to be instinctive and indigenous to the heart of man, let him be born where he may? The women of herbless Potosi grow cabbages in garden-pots.

I remain, Sir, yours, &c.
JUNIUS REDIVIVUS.

Jan. 1, 1833.

NEW CENTRIFUGAL PUMP.





Sir,—The accompanying sketches represent a new centrifugal pump, intended to raise water to considerable heights, by several simultaneous lifts, each of a height equal to the range of the common sucking pump, and so to supply the place of the force-pump within certain limits. It is a development of the principle I stated in the Mech. Mag. for the month of July last, p. 265. The pump consists of several centrifugal pumps, placed one on top of the other, and all revolving as one. It is represented as in a deep well, and the view is a sectional one: a a' a'' is the compound pump. One of the component parts described will explain the whole. a'', the undermost part, consists of a pipe about twenty-five feet long; it ends in a pivot, which works in a block resting on the bottom of the well. Above the pivot are perforations to admit water, and a valve to allow it to pass up, but not to return. The pipe opens at top into a circular head, like a very flat box, entirely open at the sides, and whose top and bottom are connected with curved radii. This is the centrifugal part of the apparatus: it is seen in a downward view at F, where the dotted curves show the radii, seen, as it were, through the top, and the small circle represents the upper mouth of the pipe. This head is always immersed in water contained in the fixed circular trough b'', supported by the sides of the well, and allowing the pipe to work water-tight through its bottom. When the pump is made to revolve briskly, the water is thrown out of the head by the centrifugal effect of the radii, and a vacuum is formed at the centre, into which water from the pipe immediately enters. a' and a are the same thing over again, the pipe of each resting on the head of the one below, and having perforations below the level of the water in the fixed trough. It seemed unnecessary to represent the machinery requisite to give the rotary motion to the whole. To set the pump to work, all the troughs, and, consequently, all the heads and pipes, are filled with water; and then, on producing a rotary motion, water will be delivered out of the topmost trough. The troughs may be made to support any part of the weight of the pump, and will also be of essential service in preventing any binding which the great length of the pipe might subject it to.

I am, Sir, your obedient servant,

Φ. M.

STENOGRAPHIC MACHINES.

Mr. Editor,—I was very much interested with the description I lately read in your valuable Magazine, of a machine to write with, said to have been invented by one Baron Drais, a German, by which it is presumed a man may write as fast, or even faster, than he can talk. Baron

Drais proposes taking out a patent for the invention: perhaps the ingenious German will find it difficult to substantiate his right thereto; for, if I mistake not, he is neither the first, second, nor third person to whom the public is indebted for the invention of a writing machine similar to the one proposed to be patented.

It is now five years since there was an account, in one of the London newspapers, of a Frenchman who had invented a writing-machine, by the use of which, it was said, a person could write *several* copies of a discourse in less time than any stenographer, without it, could write *one*. It was operated upon, like a piano, by the keys, which corresponded to the letters of the alphabet, being pressed down with the fingers. The whole cost of the apparatus was said to be about thirty pounds. In little less than three years after we were favoured with the account of another machine to write with like the former, only differing by a different inventor's name attached to it.* After a lapse of six months comes another, if possible more perfect than its predecessors. As I happen to have by me the ninth number of the *Academic Chronicle*, dated July 9, 1831, in which the account of this last machine was published, I will take the liberty of transcribing the paragraph *verbatim*:—

"*New Mode of Writing*.—A very ingenious piece of mechanism has been lately invented by a young Italian gentleman of the name of Galli, now in this country. One of its objects is to enable us to write faster than any system of short-hand hitherto known, or than any orator can speak. But this is not all: many copies of a discourse, legibly written, may be taken at the same time while it is rehearsing. It is played upon by the fingers like a musical instrument, and the manuscript is rolled off a cylinder during the course of the writing. By employing it, a book may be copied while the reader is perusing it, and as fast as it can be read. The judge on the bench may by its means take down the deposition of witnesses while his mind is intent upon the bearings of the evidence. By a little habit even the blind may be made to use an instrument which will enable them to copy faster than any short-hand writer. This ingenious machine has many other advantages which, if realised according to the inventor's expectations, will produce great changes in our present system of written or telegraphic communication."

Some called this fudge, others said time would tell. We have then an interval of eleven months—when comes Baron Drais' *incomparable!* "*perfectly original*" (*! !*)—as much superior to all its fore-elders as one improvement can be to that by which it was begotten.

The circumstance of four men—three of them at least natives of three different kingdoms in Europe—having each of them invented a writing-machine, so like one to another in construction, and yet each original—for none of them acknowledges having borrowed the other's ideas in contriving their respective machines—has scarcely a parallel in the history of the sciences. What the rest of the world may think of the matter I can't tell; but for my part I should be inclined to suppose some of the parties concerned possessed a genius for pirating as well as inventing, were it not for a singular self-evident truth, which I somewhat scruple to divulge, lest my readers should not credit me in matters of more importance. I am personally acquainted with a young man, whom at present I am not at liberty to name, who invented a writing-machine (I saw the plan of it) exactly similar in form and operation, according to description, to that of the "Frenchman's," the account of which appeared for the first time in the London newspapers, three months *after* my friend had laid his aside as being too complicated and cumbersome to be of practical utility.

Leaving these three wonderful writing-machines, along with their younger, if not quite so original, "*Cousin* German," to realise the expectations of their ingenious inventors, I am going, Mr. Editor, to speak a little of self—an employment, to little minds, not always disagreeable. Few men, I persuade myself, have been more devoted to the study of stenography (professors excepted) than myself, and still fewer who have had to contend with more real difficulties. But that's nothing; you don't want canting vaunts: well, I'll be brief. During the last six years and a half I have made, and made use of, three different kinds of machines to write with, and invented eight systems of short-hand, the least deserving of which,

* I should feel myself much obliged if any of your correspondents could refer me to the particular paper or magazine in which the above accounts of those two writing machines appeared. That I read them about the time specified I am positive; but where I can't tell; my memory is treacherous.

while existing in theory, I thought was worthy of being adopted as a national system, in respect of the superior merit it appeared to possess over every other which had come under my observation. Why, it may be asked, have I not communicated to the world some of those presumed meritorious systems? I will tell you. When I was studying Harding's system of short-hand, I met in that treatise with a paragraph, extracted from one of the Reviews, which effectually prevented me from imposing seven times on the public as much as I have done on myself. In gratitude to this kindly paragraph, for the excellent piece of service it did me, I send it you to republish, that it may "do unto others as it has done unto me."

"As the art of short-hand writing is at present much cultivated, every attempt to simplify or improve it ought to be received by the public with gratitude, provided that an author do not force upon their attention his speculative notions instead of practical results."—*Methodist Magazine.*

Previous to my seeing this I was quite big with the benevolent intention of favouring the public with one of my first big-little systems. I had now got a hint that what appeared clever to the inventor's eye might appear otherwise in other people's. At all events, I thought it best to try it personally before I attempted to saddle it upon the public. Did so—in twelve months it proved a failure; tried another, a better one—nine months proved that a failure likewise; tried another, and another; in fact, in little more than five years I tried fairly, by practical application, seven different systems, and had the mortification to find them all just worth nothing. The object I had in view was the contriving of a system by which any person of common ability could take down *verbatim* a long and complicated speech or discourse from the mouth of a rapid orator; and that such a speech would not only be perfectly legible to himself, years after it was written but could be read with facility and correctness by any other individual who was simply acquainted with that system of short-hand in which it was written.

Though I had hitherto been unsuccessful, I had lost too much time by a project to be induced to give it up, so long as there appeared a means, untried, by which the object might be attained. It is now seventeen months since my eighth system was reduced to practice. I fancy it is proving the long sought for *beau ideal.* The following is an outline of some of its prominent features:—

In the application of this system, a person can write with two hands, a pen or pencil in each hand, as conveniently as in other systems he can with one. To enable him to do this, the Chinese mode of writing, in a line perpendicular to the breast, is adopted in preference to the horizontal, from left to right, or the contrary. The number of the alphabetical letters made use of is 29, fifteen consonants, and fourteen vowels. The consonants are represented by characters, the simplest supposed to be in nature, and which readily combine with each other. Their assigned place in composition is on the right side of the line, being written with the right hand. The vowel characters are merely those of the consonants repeated, but placed on the left side of the line, and are written with the left hand. These vowel characters not only represent all the vowel sounds in the English language more effectually than those in the common English alphabet, but, by being placed in certain positions with reference to the preceding or following consonants, all those awkward clusters of consonants which often occur in words may be, either in part or entirely, omitted, their presence being understood by the said significant position of the vowels. I have been too verbose already to expatiate on the apparent merits of this system, which would be better seen in order to be acknowledged.

In attempting to take notes of public speeches, &c., I have hitherto only written with one hand, to avoid being singular; but in private practice I make use of both, assisted by a small machine, or portable writing desk, of the size of a royal quarto volume, upon which I can write with both hands as conveniently as with one—no matter what situation I be in. I could copy a discourse with it—standing or walking, sitting or lying down. It is now ten months since I began to teach the system to a boy of fifteen years of age. Either of us, by its means, with the little practice we have had, can transcribe any page of good English composition, consisting of forty lines, fifteen syllables to a line, in something less than seven minutes—if rehearsed, in about three and a half. A

page thus written by one, can be read by the other as easily and as correctly as the ordinary correspondence of one man can be read by another. If the duties of our employment will admit of our practising two or three hours per day, I flatter myself, before the expiration of two months, we shall be able to communicate with each other, by writing, little less rapidly than other people can by the faculty of speech. In the meantime, we should be glad of an opportunity to try our skill with any two professors of swift writing, of acknowledged ability. Be one of them Baron Drais, assisted with his machine, or Galli, the Italian, with his, or the Frenchman, with his. After a fair competition, the public then would be able to distinguish between "speculative theories and practical results;" and thereby be directed in their choice of a national system of swift writing, the utility of which will be obvious to all to whom the matter is conversant.

I remain, your humble servant,

THOS. SKAIFE, Schoolmaster.

Highgate School, Kendal, Westmoreland, December 10, 1832.

PLAN FOR FREEING LONDON FROM SMOKE.

Sir,—I shall feel obliged by your giving the following "Plan for freeing London from Smoke," a place in your valuable Magazine.

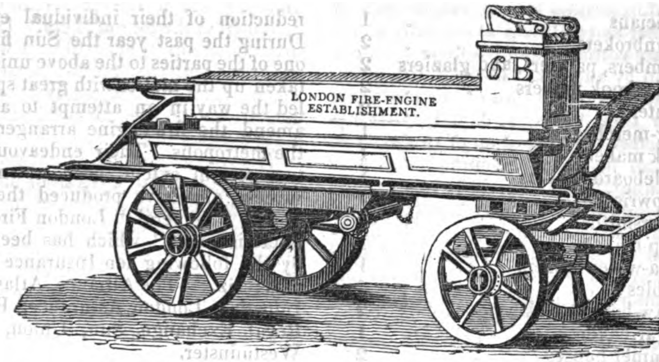
Let there be a number of immensely large chimneys built in the public squares or other convenient places, with subterraneous flues to conduct the smoke to them, on the plan of the City Sewers; that is to say, a flue might go up the centre of every street, which would receive the smoke from all the houses in that street, by means of pipes and dampers to regulate the draught from every fire-place, and the flues from the narrow and back streets would empty themselves into the large flues in the principal streets, which would conduct the smoke to the chimneys. If the chimneys were built of stone of different specimens of architecture, and as high and large, or even larger, than the tower of St. Paul's, they would add much to the grandeur and beauty of the City, while the houses and public buildings themselves would look much better if the dirty chimneys were taken from the tops of them. If the plan were once put in operation, it would cost as little, with new buildings, to turn the smoke from the fire-places into the subterraneous flues, as to build small chimneys to carry it away.

If government or the public would undertake to make a trial of my plan, I have no doubt it would prove effectual, for in many parts of the manufacturing districts of the kingdom it is not uncommon to see one large chimney built (about 150 feet high) to take away the smoke from several manufactories where they belong to one firm; and although the chimney is often built at a considerable distance from the fire-places of some of the engines, yet the power of draught is surprising. I conceive that a chimney of the same dimensions as the steeple of St. Paul's, would be amply sufficient to take away the smoke from a thousand houses. It might be thought by some, that, if in practice, great difficulty would be experienced in cleaning out the flues when full of soot: as regards that, I would remark, that if the flues and chimneys were properly constructed, they would seldom want cleaning, as the draught would be very strong, and if a body of men were maintained at the public expense for that purpose, with suitable implements, the difficulty would soon be got over, and the expense to the public would not be so much as is now incurred in paying for chimney sweepers. Another objection to my plan might be urged in supposing that the smoke, in certain conditions of the atmosphere, would descend from these large chimneys, and fill the streets before it got blown over the City. If the chimneys were built sufficiently high, I do not think that that would ever be the case; but supposing that it were the case occasionally, I should think a remedy might be found by admitting steam at the bottom of these large chimneys, as it is a well-known condenser of smoke.

If the plan, Mr. Editor, were adopted, I think it would be found to answer extremely well, in not only freeing the streets of London from smoke, but in curing all smoky chimneys.

I am, Sir, your obedient servant,

EVAN LEIGH.



LONDON FIRES IN 1832.

"The summon'd firemen woke at call,
And hied them to their stations all.
Starting from short and broken snooze,
Each sought his pond'rous hob-nail'd shoes,
But first his worsted hosen plied,
Plush breeches next, in crimson died,
His nether bulk embraced;
Then jacket thick of red or blue,
Whose massy shoulder gave to view
The badge of each respective crew,
In gold or silver traced.
The engines thunder'd thro' the street,
Fire-hook, pipe, bucket, all complete,
And torches glared, and clattering feet
Along the pavement paced."
Rejected Addresses.

Dear Sir,—The return of another "happy new year," brings me before your readers with an account of some of the calamities of the past. There were, in the year 1832, two hundred and nine fires, as exhibited in the following table:—

Months.	Number of Fires.	Number of fatal Fires.	Number of Lives lost.
January . .	28	0	0
February . .	23	0	0
March .	19	1	1
April . .	16	0	0
May . .	13	1	3
June . .	9	0	0
July . .	16	0	0
August . .	14	0	0
September .	15	1	1
October . .	18	1	1
November .	15	0	0
December .	23	3	3
Total . .	209	7	9

Of this number of buildings attacked by fire, there have been consumed 50
Partly consumed 6
And slightly damaged . . . 153

209

The premises at which the fires happened, were occupied as follows:—

Bakers . . .	10
Blacking makers . .	1
Booksellers and stationers .	4
Bookbinders . . .	2
Boot and shoe makers .	3
Brass founders . .	2
Brewers . . .	2
Brush and broom makers .	2
Cabinet-makers . .	6
Carpenters and box-makers .	7
Carver and gilders . .	2
Chandlers . . .	6
Cheesemongers . .	2
Chemists and druggists .	3
Coachmakers . . .	2
Coal merchants . .	1
Coffee and eating-houses .	5
Coopers . . .	1
Distillers . . .	1
Dwellings, private . .	50
Dyers . . .	1
Featherbed makers . .	1
Fellmongers . . .	1
Fringe and lace dealers .	2
Glass warehouses . .	3
Greengrocers and fruiterers .	6
Grocers and tea dealers .	5
Haberdashers and hosiers .	3
Hatters . . .	1
Ironmongers . . .	1
Jewellers . . .	2
Lampblack makers . .	1
Leather cutters . .	1
—— hose and bucket makers	1
Linendrapers . . .	1
Machinists . . .	2
Milliners and dress makers	2
Milkmen . . .	2
Music sellers . . .	1
Oil and colour men . .	10

Opticians	1
Pawnbrokers	2
Plumbers, painters, and glaziers	2
Pocketbook makers	2
Printers	2
Rag-merchants	1
Sack makers	1
Scaleboard makers	1
Shipwrights	1
Silversmiths	1
Soap makers	1
Soda-water makers	1
Stables	2
Straw-bonnet makers	2
Sugar bakers	1
Summer houses	2
Tailors	3
Timber merchants	2
Tinmen	4
Victuallers, licensed	14
Wadding makers	1
Wine merchants	3
Total	209

For the last three or four years, the number of fires has been gradually decreasing; and not only has the number been diminished, but the extent of the conflagations has also been, upon an average, much more limited than formerly. During the last year there were not above half a dozen fires of any considerable magnitude.

The number of lives lost, as per foregoing statement, is *nine;* but the total number of persons burnt to death, from the accidental ignition of wearing apparel, &c., is much greater.

After encountering considerable difficulties, arising from various causes, the Lambeth Water Company have at length completed a capacious reservoir on Brixton Hill, upwards of one hundred and eighty feet above the level of high-water mark, a supply from which, in case of fire, will be available all over the Lambeth Company's district. The reservoir is supplied from the works in Belvidere-road, by a splendid *single-acting* steam-engine (by Messrs. Maudsley and Field), of one hundred and ten horse power. This particular form of engine, however, is in the present case injudiciously employed, and the consequences have been a series of shocks upon the mains, so violent as to occasion continual bursting.

I stated in my last communication on this subject, (Mech. Mag., Jan. 28, 1832,) that some of the insurance companies had formed a kind of league, with a view to the reduction of their individual expenses. During the past year the Sun fire-office, one of the parties to the above union, have taken up the matter with great spirit, and led the way in an attempt to alter and amend the fire-engine arrangements of the metropolis. Their endeavours have, to a certain extent, been crowned with success, and have produced the formation of a general "London Fire-engine Establishment," which has been joined by the following ten Insurance Companies; viz.:—The Alliance, Atlas, Globe, Imperial, London Assurance, Protector, Royal Exchange, Sun, Union, and the Westminster.

The remaining seven offices refuse to join the Brigade (as the establishment is frequently termed), and continue to work their men and engines on the old plan. These offices are the British, County, Guardian, Hand-in Hand, Norwich Union, Phœnix, and the West of England. Some of these, however, are favourable to the new system, but wish to see its practical operation previous to making any material change in their establishments.

The affairs of the London Fire-engine Establishment are managed by a committee, consisting of a director or secretary from each of the Insurance Companies that have joined it, and who subscribe towards its support in certain agreed proportions. The annual expense of the establishment will be nearly £8,000.

The metropolis has been divided into five districts, which are as follows:—

North Side of the River.

District A.—From the eastward to Paul's Chain, St. Paul's Churchyard, Aldersgate-street, and Goswell-street-road.

B.—From St. Paul's, &c., to Tottenham-court-road, Crown-street, and St. Martin's-lane.

C.—From Tottenham court-road, &c., westward.

South Side of the River.

D.—From the eastward to Southwark-bridge-road.

E.—From Southwark-bridge-road, westward.

The force consists of eighty men, in the permanent employ of the establishment, a great majority of whom have been selected from the firemen hitherto employed by the above ten insurance companies,

and who have relinquished all other occupations on being appointed to the establishment. Instead of the men being under distinct officers appointed by each company, and therefore not acting in concert at fires, they are now embodied under the direction of a Superintendent, with foremen and engineers under him, and appointed to certain stations, according to the accompanying list, where a portion of them are in constant attendance day and night, prepared to give the most prompt assistance, on all occasions of fire:—

Engine Stations.

Prince's-square, Ratcliffe.

Jefferies'-square, St. Mary Axe.

Whitecross-street, Chiswell-street.

Watling-street, No. 68, DOUBLE STATION, *and residence of the Superintendent.*

Farringdon-street, adjoining the Rose Inn.

French-horn-yard, High Holborn.

Bedfordbury, Covent Garden.

Wells-street, Oxford-street.

King-street, Golden-square.

King-street, Portman-square, corner of Baker-street.

Waterloo-bridge-road, opposite the Coburg Theatre.

Southwark-bridge-road, near Union-street.

Morgan's-lane, Tooley-street.

The following are the stations of extra engines:—

Schoolhouse-lane, Shadwell.

Horseferry-road, Westminster.

Edward-street, Pedlar's Acre, Lambeth.

Broadway, Rotherhithe. The men appointed to this last engine have also the care of the floating engine, which is moored off King's-stairs, Rotherhithe.

There is one engineer, two senior, and three junior firemen attached to every engine-station in each district, one-third of whom are constantly on duty at the different engine-houses, night and day; and the whole force are liable to be called up for attendance at fires, or for any other duty. In general, the attendance will be arranged as follows, viz.:—

If a fire happen in district A, the whole of the men and engines of that district will immediately repair to the spot; two-thirds of the men, and one of the engines from each of the districts B and D will also go to the fire, and one-third of the men from each of the districts C and E.

If the fire happen in B, the whole of the men and engines in that district will immediately repair to the fire; one engine from A, another from C; two-thirds of the men from A, C, and E, and one-third of the men from D.

If the fire happen in C, the whole of the men and engines in that district will immediately repair to the fire; one engine and two-thirds of the men from each of the districts B and E, and one-third of the men from A and D, will go to the fire.

If the fire is in E, the whole of the men and engines in that district, with one engine and two-thirds of the men from each of the districts C and D, and one-third of the men from A and B, will go to the fire.

If the fire happen in D, the whole of the men and engines in that district, with one engine and two-thirds of the men from each of the districts A and E, and one-third of the men from B and C, will go to the fire.

If a fire happens on the boundary of a district, and it is doubtful in which district it has occurred, the whole of the engines and men of the two adjoining districts are instantly to proceed to the spot, and one-third of the men of the three remaining districts.

In case of emergency, the superintendent will call in such additional force as he may require.

The engines will be conveyed to fires at not less than seven miles an hour, and the men who do not accompany the engines will go at not less than five miles an hour.

The men are clothed in a dark grey uniform, trimmed with red, having their respective numbers in red on the left breast; they have black leather waist-belts, and hardened leather caps or helmets. Their dress is neat and appropriate, and much more conducive to safety and comfort than that formerly worn. The leather caps especially afford a very great protection to the wearers, and it is somewhat strange that they should ever have fallen into disuse, for they were some years back very common. The new caps, however, are better made, more convenient, and much smarter than those formerly used.

The men are paid weekly at the following rates:—

A junior fireman, 3s. a day, or 21s. a week.

A senior fireman, 3s. 6d. a day, or 24s. 6d. a week.

An engineer or foreman, 4s. a day, or 28s. a week.

The foreman of a district receives 1s. a week extra for every engine in his district.

A sum of money is appropriated for the remunerating of strangers assisting to work the engines at fires, by which means a sufficient quantity of manual power will always be readily obtained.

The engines have all been rendered uniform in appearance and equipment; they are painted bright vermilion, with the words "LONDON FIRE-ENGINE ESTABLISHMENT," in gold letters on each side, with district letter and the number of the engine in the district, as shown in the sketch at the head of this communication. The connecting screws of the engines and hose are all new and on an improved construction; they are all of the same thread, so that any one piece of hose will fit every other piece of hose and engine belonging to the establishment.

Each engine is provided with the following judicious selection of useful articles:—Two lengths of scaling ladder, each eight to nine feet long, all of which may be readily connected, forming, in a short space of time, a ladder of any required height; a canvas sheet, with ten or twelve handles of rope round the edge of it. (*i. e.* one of Buston's fire escapes see vol. 9, p. 213, and p. 82 of vol. 11.) One ten fathom, and one fourteen fathom piece of 2½ inch rope. Six 40 feet lengths of hose. Two branch-pipes, one 2½ feet, and the other from four to six feet long; with one spare nose-pipe. Two six feet lengths of suction-pipe. A flat rose, standcock, goose-neck, dam-board, boat-hook, saw, shovel, mattock, pole-axe, crow-bar, and two dog-tails. A ball of strips of sheepskin, a ball of small cord, and instruments for opening plugs, fire-cocks, &c.

The above list shows that the attention of the firemen is especially directed to the saving of human life, as well as the rescue of property, and the most speedy suppression of fire.

The Commissioners of Police have expressed their readiness to aid and assist the exertions of this establishment to the utmost of their power, and have made arrangements for forwarding early information of the occurrence of fires to the several engine-stations, which will ensure the prompt attendance of the men and engines.

Under the vigilant eye of the new establishment, pains will be taken to ascertain in every case, if possible, the real cause of the fire; a question of vital public importance, and one which has not hitherto been sufficiently investigated.

One of the many important and striking features of this establishment is, that every fireman may expect to rise to the superior stations by intelligence, sobriety, and general good conduct; and that mere seniority, unaccompanied with these necessary qualifications, will not, as heretofore, command promotion.

The London Fire-engine Establishment commenced operations on the 1st of this month; and although I have furnished but a brief and imperfect outline of the various systematic improvements introduced into its arrangements, still I flatter myself that I have written enough to show that all parties must eventually be gainers by the change. Nearly all the defects and deficiencies of the old fire-engine arrangements of the metropolis—so long felt and so frequently regretted—are supplied by the admirable regulations of the new corps; which appear to me to be calculated to ensure an increased amount of comfort to the firemen, and the greatest possible protection to the public, that the resources at command will afford.*

I shall not at this time enter into an explanation of my opinions as to the propriety or economy of *such establishments, so supported*, but I may hereafter resume the subject. At some future opportunity I will also explain more fully than time or space will now permit, some of the ingenious mechanical improvements introduced in the equipment of the present fire-engines.

I cannot, however, conclude this paper without congratulating the Directors of the Establishment on their good fortune in securing the valuable assistance of Mr. James Braidwood in the formation of the establishment, and in the highly

* A public functionary of one of the fire-offices, of considerable notoriety, under the shelter of a fictitious signature in a Morning Paper, has grossly and wantonly calumniated and misrepresented the men and measures of the Establishment, and endeavoured to prejudice the public against them by statements which are utterly false.

responsible office of Superintendent. Mr. Braidwood is, above all others, the person most likely to ensure the welfare and success of the establishment: he was Master of Fire-engines in Edinburgh seven years, and by his zeal, assiduity, and skill succeeded in raising the fire-engine establishment of that city to a state of unparalleled perfection.* Mr. Braidwood is already favourably known to the public by his practical treatise on fire-engines,† and possesses, both in public and private life, the esteem and good wishes of all who have the pleasure of knowing him.

With the sincerest wishes for the success of the new establishment,

I remain, Sir, theirs and yours,
Very respectfully,
WM. BADDELEY.

London, Jan. 10, 1833.

OXYGEN GAS.

Sir,—I have lately pursued a plan for making oxygen gas, for experimental purposes, from the peroxide of manganese, by which I obtain a large quantity in a comparatively short time, and with very little labour. To those of your readers who reside in towns that are lighted by coal-gas, perhaps the following directions may be useful.—Mrs. Glasse, I believe, it is, who advises her readers to "catch a hare" before they dress it,—so must I advise that permission be obtained from the proper authorities before any of your readers commence their manipulations at gas-works. Procure a cast-iron vessel, called a syphon, and which is extensively used in gas operations to collect the condensation from the mains. That which I employ is about six inches in diameter by ten inches in height, and of a cylindrical form. There are usually three openings to the syphon, one on the top, and two opposite to each other in the side. Two of these openings must be securely plugged with iron. To the third opening (one of those in the side) let there be adapted nine or ten feet of half or three-quarters inch iron tubing. The syphon being about two-thirds filled with peroxide of manganese, attach to it the iron tubing, and introduce it into a coal-gas retort.* If the retort be at a good heat, vapour will be instantly evolved in great abundance; and by the time the flexible metallic tubing is adapted to the iron tubing (which might be done with clay), and connected with the gas-holder, oxygen gas will probably have made its appearance. I have made in this way 4,000 cubic inches of gas in two hours. I have twice tried a blacksmith's forge for making oxygen gas; but on both occasions I melted the retort, although it was, apparently, well shielded by fire-bricks.

J. O. N. RUTTER.

Lymington, Hants, Jan. 8, 1833.

FREEZING OF GAS-METERS.

Sir,—I beg leave to inform Mr. Rutter (vide p. 201) that it is no very uncommon thing for the water in *coal-gas* meters to be frozen in winter, if they are much exposed to the weather. There was some time back a large establishment in this city, under my own immediate cognisance, which was supplied with *coal-gas* through two five-light meters, one at the back, the other at the front of the premises. The former was exposed to the weather, being imprudently placed just beneath a grating, and was invariably set fast every sharp winter by the water being frozen; and has more than once been materially injured by the freezing process. The other meter, being placed in a warmer situation, has not yet been frozen; and that portion of the premises which was supplied by it has been comfortably illumined; while the remaining part has been in total darkness, to the great annoyance of the occupants.

It has been proposed to prevent the freezing by putting a little spirits of wine into the water, but I do not know if this plan has ever been tried. I like Mr. Rutter's suggestion for a hot-bath; but I am of opinion that it would be but seldom requisite, if the gas-fitters would exercise a little more judgment and discrimination in selecting a situation for the meter.

I remain, yours respectfully,
W. BADDELEY.

Dec. 31, 1832.

* See Mech. Mag., for August 20 and 27, 1831.

† On the Construction of Fire-engines and Apparatus, the Training of Firemen, and the Method of Proceeding in Cases of Fire. By James Braidwood, Master of Fire-engines in Edinburgh. Edinburgh: Bell and Bradfute, and Oliver and Boyd; and Tilley, 166, Blackfriars-road, London.

* Of course this can be done only when the retort is not at work, which most frequently happens in the afternoon, just before the time for turning on.

HALL'S IMPROVEMENTS IN STEAM-ENGINES.

Sir,—Mr. Hall's piston maker, "Audax," has certainly chosen a most appropriate signature to the reply it hath pleased him to make to my remarks; but I fear he has been more *bold* than prudent in adventuring some assertions, on which it now becomes my province to animadvert.

In the first place, instead of defending the pistons on the score of utility, he, in opposition to the evidence furnished by Mr. Hall's own drawings, does confidently assert that he finds no complexity at all in making them; by which I understand he would have said the same had there been ten times as much, provided always, that there should be no more than he could get paid for. With regard to his query, I for the present shall follow his example, by advising him to read the article "again and again," as I think the sentence sufficiently explains that I was not so egregiously mistaken as to imagine Mr. H. meant his piston to be any other than he has shown it in his sections.

With respect to the improved slide, I have sinned, not by supposing the face-plates (not fan-plates, Mr. Editor) required adjusting once an hour, instead of once a month, but merely in stating that such adjustment could not be effected at the only proper time, viz.: when, by the patentee's own showing, the surfaces are rendered untrue by the application of heat.

Respecting the lubrication — as this gentleman has so confidently answered my former query, he perhaps will not object to another. As the oil passes with the steam through the condenser, refrigerator, air pump, &c. &c., its temperature is of course equally reduced—I therefore now wish to ask, whether so plentiful an injection of the lubricating matter is not necessarily attended with a considerable degree of condensation?

"Audax" commences his reply to my remarks on the improved method of condensation with a direct puff,—runs on with an unnecessary quotation,—confesses the thing to be a complete enigma, and, his valour forsaking him, he falls almost into despair for fear he should be unable to make it intelligible. After then telling us what would occur on taking the caps off the ends of the refrigerating pipes, he proceeds—"but mark this: if you put a cap on each end of every pipe, and fill the pipes in the first instance with cold water, these caps will always continue to keep the pipes so filled; therefore, as the working of the air-pump produces a vacuum at the ends of the pipes," &c. Now, Sir, how was I to understand what was never before even hinted at—what is, besides, altogether a contradiction?—for pipes that are kept *always full* of water, could never be supposed to have a vacuum at one end of them. If we allow the thing (either by magic or otherwise) to be as he says, it must then follow that the improved engine is entirely dependent on a small air-pump—at any rate for its first vacuum. Now, it is well known to almost every person who has ever seen one, that no condensing engine will start with her work until a vacuum has been produced. But, Mr. Editor, I should have imagined that when the air-pump had removed, as he says, a portion of the water contained in these pipes, the vacuum so caused would neither be at one end nor the other, but, from the position of the pipes, that the natural gravity of the water must find its level, when there would be a clear passage from end to end of the pipes—only reduced, of course, in their sectional area by the water confined therein by the caps.

Not content with being thus shifting himself, "Audax" then pretends to give Mr. Hall's own words, as being more explanatory on this important and interesting point. I say *pretends*, because I observe that you, Mr. Editor, profess to give the whole in the patentee's own words, and I have been since favoured with the sight of a pamphlet, in which there are no such words as those given within inverted commas by "Audax." Without staying to inquire where this improved version sprung from, I will at once examine into its importance. Truly may it be said that a drowning man will catch at straws, for all that can be gathered from this new reading is, that that for which one minute is too short, may be very effectually accomplished in thirty hours! But what have we to do with the heat or caloric contained in a given quantity of steam, any more than merely to abstract so much of it as will reconvert it into water?

To his concluding sentence I beg to say, I fully understood that the boilers were to be supplied with the water of

condensation; but while they are so supplied in the usual way, I fear, were I to continue reading "again and again" until doomsday, I should not discover any improvement in the method, and should yet have to learn how feeding them with water somewhat purer could constitute a separate invention.

Having discussed the paper of "Audax" at such length, I need say but little to the one by Mr. J. Ride. First, then, I think there is but little room for his surprise, as I am unacquainted with any rule by which to discriminate between pieces of quackery and inventions of real worth, particularly when announced by statements that in some instances appear incredible, and in others are entirely erroneous. I would have Mr. R. understand that his exclamations of *scientific! beautiful!* and *easy of construction!* is no proof whatever of incorrectness in my remarks on Mr. Hall's piston and valve, which, if they are at all dependant on any lubrication to make them steam-tight, can neither be scientific nor correct in their construction; nor can I, I do assure him, see any amazing loss of power consequent on pumping out the injection-water. I really think it would put him to a nonplus to inform us correctly what extra power is required to work the air-pump solely on account of the injection-water.

The saving of fuel effected by each respective part of Mr. Hall's invention never was, nor need it ever be a question; but it is certainly very surprising that, having had the "opportunity of seeing the whole in extensive operation," Mr. Ride should have neglected to ascertain, and that as accurately as possible, the *actual* amount of the saving, more particularly as that must in most cases be the only practical question asked. It is certainly most worthy of remark, that "Audax," with all his boldness, has not said one word respecting the saving of fuel, and that Mr. J. Ride has ventured only to guess at it, but is prudent enough to keep even his guess to himself. Such friends as these, like the bear in the fable, are apt to do more mischief through their officiousness than many open enemies.

Next follows a prophecy—a sort of thing I never interfere with; but I much wish he had informed us how he could make a condenser of what he is pleased to term the substratum of all the inventions, and which is described as a series of pipes "kept always full of water," into which the steam is forbid by the patentee to enter until it is first condensed? I repeat that, as a condensing apparatus, they can be of no earthly use. I must now thank Mr. R. for his notice of Mr. Hall, so considerately intending to bring the mountain to Mahomet, and sincerely hope that *his* may not bring forth a mouse.

Yours, respectfully,
T. V. Robson.

Jan. 10, 1833.

ANSWERS TO INQUIRIES.

Straits of Gibraltar.—"Nauticus" should read Dr. Halley's paper on the disposal of the water which flows into the Mediterranean through the Straits of Gibraltar; also Dr. Wollaston's account of Dr. Marcet's investigations on the subject; the former of which he will find in Dr. Halley's works, the latter in the Philosophical Transactions for 1829. The fact on which the general belief of the existence of a return under-current is founded is simply this—that the wrecks of ships, known to have sunk in the Mediterranean, have risen afterwards in the midst of the Atlantic. How could this be otherwise accounted for?

Vegetable Life.—We feel so satisfied that no vegetation would take place under the circumstances mentioned by T. A. J., that we cannot advise him to be at the trouble of an experiment. Were there even some solitary germ left undestroyed by the heat, it could not emerge into life without the help of air.

Gems.—Mr. Mawe, of the Strand, published some years ago a small work on Gems; which, though not all that could be desired, will answer "A Young Jeweller's" purpose better than any other with which we are acquainted.

INTERIM NOTICES.

☞ *The Office of the Mechanics' Magazine is removed to No. 6, Peterborough Court, between 135 and 136, Fleet-street.*

The papers sent us by "Vindex," shall be forwarded to F. H.

"Iron." In answer to his private note—most willingly.

The practice recommended by W. de Wykes, was common in a northern capital of considerable celebrity a great many years ago, but disappeared along with the barbarism of manners out of which it arose; and ought not, in our humble judgment, to be revived any where.

We do not recollect the inquiries alluded to by B. W.; we sometimes receive very ridiculous ones, and judging from the style of B. W.'s complaint, we should think his must have been one of that description—and on that account thrown aside.

Communications received from Chemicus—A Bricklayer—J. S.—T. M. B.—Mr. Rough—R. Williamson—C. C. C. C.

Erratum—In a few copies of last Number, p. 251, col. 2, line 24, for "population" read "proprietary."

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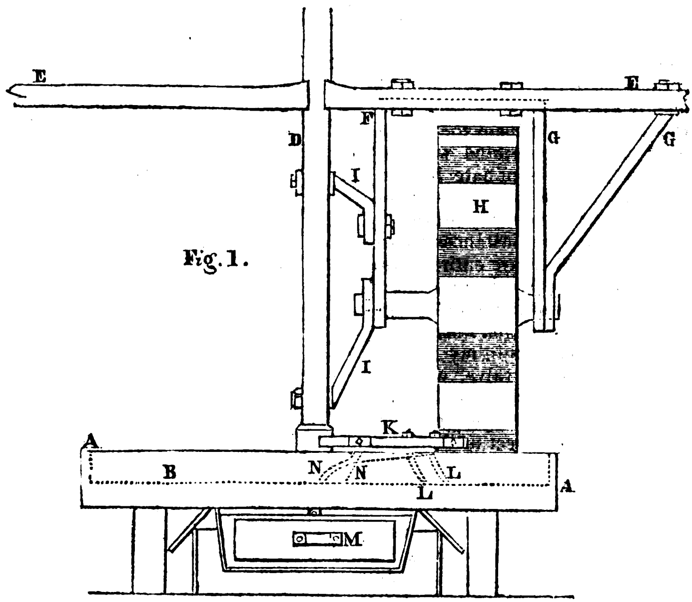
MONDINI'S CRUSHING AND SIFTING MACHINE.

Fig. 1.



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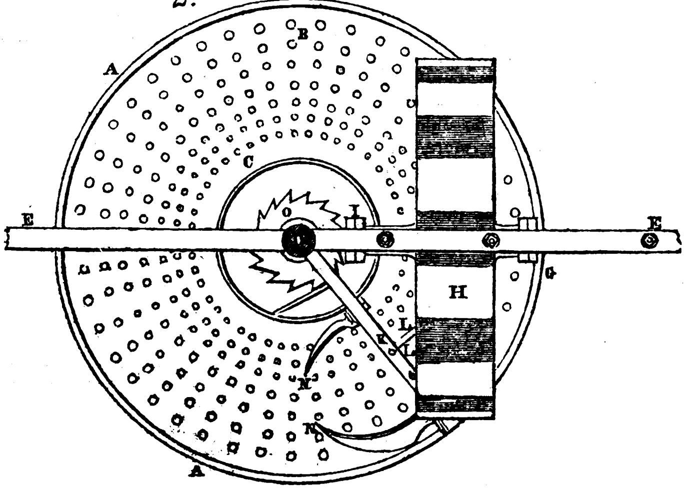


MONDINI'S CRUSHING AND SIFTING MACHINE.

The prefixed engravings represent an elevation (Fig. 1) and plan (Fig. 2) of a crushing and sifting machine, invented by D. A. Mondini. A, is a circular cast iron trough, the bottom of which (B), between the rims A and C, is pierced with a number of holes, which allow a free passage to the bruised materials. D is a wooden arbor, which rises vertically from a hole in the centre of the trough. E E are two cross arms inserted into this arbor. From the under side of one of these arms there descend two beams F G, which carry the axis of the cast iron drum H; and, to strengthen this framework, the beam F is attached by the braces I I to the arbor D; the circumference of the drum H is rasped like a coarse file at regular distances, the better to enable it to crush the substances placed under it. K is a horizontal piece of iron, which is attached by a collar to the arbor D, and follows the motion of the drum H, close to which it is placed; this piece of iron has two projecting curved teeth L L, which serve to stir up the materials after the drum has passed over them, while the two ears N N, also attached to the piece K, throw them towards the centre, so that they shall be again presented to the drum as it revolves, by which means any portion of them not sufficiently bruised at the first revolution are sure to be so at the second. M is a wire gauze sieve placed under the trough, for the purpose of separating the fine from the coarse portions of the bruised substance; this is effected by means of the ratchet wheel O placed in the centre of the trough, which, as each tooth gets free, gives a jolt to the sieve. Motion may be given to the apparatus by manual force, applied to the arms E, or by any other moving power.—*Recueil Industriel.*

ART OF COACH-BUILDING.

Sir,—I should congratulate myself excessively could I believe that the letter in the Mech. Mag. for Dec. 29 last, signed "Phæton," were *bonâ fide* the production of one of the coach-building guild, as the writer intimates himself to be. But he is far too "skilful in the use of (scientific) words," and cannot even pronounce the shiboleth after the approved technical fashion. Now, I will venture to appeal to the first jury which can be collected, conversant with wheel-carriages and their appurtenances, from the commonest stable-boy, up to the famed Leader or Hatchett, whether the word *Phæton* be a legitimate word upon any carriage mart whatever. It is no more like the real practical phrase, than the long black coffin-looking box meant by it, is like the antique chariot of the Sun-god which was the means of breaking the neck of his aspiring youthful heir. I fear that the *Foreign Quarterly* reviewer is at work again to defend his article. A true carriage builder would have signed himself in language that might be understood by his fraternity, and would not have used "hard words." In his next letter, let him alter it to "*Feeayt'n*," or they will not know what toll to charge upon it at the turnpike gates, and much wonderment will be excited amongst the "rumuns," and "them as knows things." Jesting apart, it is too much to expect that, because I show the defects of an existing machine, I should therefore possess the knowledge necessary for remedying them. If authors were to attack their critics after this fashion, there would be an end of criticism. All the world is probably aware, that the mass of English law is very mischievous; but it does not therefore follow, that every man amongst the fault-finders would be capable of making good laws. If no fault is to be found till the fault-finders can amend it, farewell improvement. With regard to the "patent axle-trees of the ingenious Collinge," was there ever a patent, or an effective patent, for them? I have heard there never was. But carriage-builders can take no merit from them. As for the "C springs," by which I presume are meant the circular upright springs from which the body is suspended, let any unprejudiced man—not of the guild—look at the jigging, jolting, uneasy movement produced in them, as the carriage passes over a rough road, with cross motions every way, and then pronounce them "scientific" or "beautiful" if he can. Let him then look at one of the carriages built, without perches, opposite Astley's Amphitheatre, in which all the work is borne upon four double elliptic springs placed on the axles. Let him mark how well and mechanically they act over every road, accommodating themselves to the inequalities, and he will agree with me, that they are in-

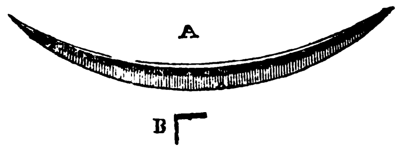
finitely superior to the carriages with "C springs." Marry, I speak not of their beauty; they have none. The man who invented them had no idea of beauty, nor perception of proportion, or the harmony of lines: he took the carriage as he found it, and forced a circular-shaped body into unnatural union with horizontal springs. As a machine at rest, a carriage with "C springs" is certainly a more graceful object, inasmuch as the various return curves fall into one another; but as for "science," avaunt! With respect to the "practical skill of their constructors," I never questioned it. The workmen are first-rate, and use excellent materials; but the fact that the carriages make the tour of Europe, is no proof of their beauty or perfection. It is merely a proof that they are strong. English ships sail round the world, and never start a trenail; but, as Jonathan sometimes remarks, "they are tarnation ugly, surely."

"Phæton" alludes to the sarcophagus form of the Lord Mayor's, and other antique coaches, as a proof that carriage-builders have the sense of beauty strongly upon them, and have therefore designedly taken to the ellipse. Not so. It has been the result of necessity, which has caused many more things in this world. Let me digress an instant, as I am on the subject of carriages. When Joseph Bonaparte first went to reside near Philadelphia—where many members of the Society of Friends keep neat plain carriages, drawn by two horses—the Ex-King resolved to give Jonathan a taste of his quality, and appeared in style, with his carriage drawn by six horses, with outriders. Jonathan was for once taken aback, but thought the matter "awful scandalous," and cogitated upon a remedy. Accordingly, a number of young men clubbed their horses, and the next time King Joseph appeared with his coach and six, Jonathan appeared with a coach and six-*teen*, "took the shine out of him," and "gave him the go-by." He did so no more. To return to my subject: the Lord Mayor's coach is constructed without springs, and the centre of gravity of the body is by no means well adjusted. The carriage was never intended except as a pageant machine, to move at a slow pace. Were Jonathan to get it up to a gallop, with his sixteen horses, the body would probably overset, and "shoot its rubbish:" the good city of London would quake to its foundations at the overthrow of its oily dignitaries, and all its commerce be stopped! When springs were first used to carriages instead of the upright timber framings, the danger of oversetting the body became greater, especially when the speed was increased. It was necessary to lower the centre of gravity, and thus the bottom part assumed a circular form. Sudden jolts caused the bottom to strike the perch, and the perch was made to assume a curved form, to put it further off Still it would not do. The centre of gravity was not low enough from the point of suspension, and the short staples on the body, to which the braces were affixed, were lengthened into a set of long branching irons, with return curves reaching high up. But this was not enough. The springs were straight and nearly upright, and the jar, on a rough road, was terrific; they were consequently slanted forwards and backwards, and, after many trials, curved into two-thirds of a circle, to make the play as perfect as possible. Still, not being sufficient, undersprings were at last added, and there the matter has rested even unto this day. Amongst the hackney coaches, all these varieties may still be observed. I think I have made it sufficiently clear that, so far from "security being sacrificed to appearance," appearance has actually grown out of a necessity for combining security with increased comfort.

Without any intention to dogmatise on the subject of carriages, my opinion is that even the best among them are very far inferior to what they might be, had builders any motive for improving them. The owners of cotton mills at Manchester are far from feeling obliged to inventors who may discover improved machinery. They are quite satisfied if they possess the best kind in actual use, because no one can then undersell them, and they very devoutly wish every inventor at the ——, who, by his discoveries, forces them to fresh expenses, to compete with his improvements. Thus, the "few builders of good carriages" view their trade purely as a mercantile matter, in which they wish to make as large a return as possible, and they set down every inventive brother of the craft as a schemer, *i. e.* a fool. They are wise in their generation. They are money-seekers, not perfectors of

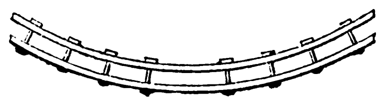
mechanism; and "Phæton" himself admits that "good carriages are a very small minority." "Improvement in the public taste" will rectify this; and though not wishing to undertake "a course of lectures," I am of opinion that "C springs" will ultimately give place to horizontal ones, in elegant curved lines, with which all other parts of the carriage will be made to harmonise. It is probable that the next generation of carriage-builders will be a more scientific race, and if so, there will be a great stride forwards.

Did "Phæton" ever see a "landau?" I once did. It was in Piccadilly, at the door of a shop for "great folks," at which an open landau was drawn up, and I stopped to remark a family who were entering it, my attention being drawn to a very handsome child belonging to the party. When they had entered the carriage, that degraded parti-coloured animal, called in Scotland the "flunkie," could not shut the door, on which the coachman dismounted from his seat, and applied his shoulder beneath the doorway to raise it up, when the flunkie was enabled to close it. Being rather curious in tracing effects to their causes, I took the first opportunity of examining the construction of a landau, and found that, when the head was thrown open, the weight had a tendency to force the door-posts together at the top. The only resistance to this tendency was the piece of strong ash framing forming the bottom of the door-case, on the top and bottom of which were flat plates of iron, some three quarters of an inch in thickness, strongly bolted together, and weighing, I should imagine, about forty pounds. Yet all this mass of iron and wood was inefficient to form a rigid body. I have since observed that all carriages made to open are constructed after the same fashion. Now, if "Phæton" be really a constructor of carriages, I will recommend him an improvement, which will make his landau bottoms firm, with half the weight of metal. There is a substance, known to engineers, called "gunnel iron," used for making the angles of boilers. Let him get some of this gunnel iron, and cause his smiths to fit plates of it beneath his framing, and against the rocker-bottom which drops below the framing. He will then have a face plate and an edge plate all in one, which may be very light, because the resistance of an edge plate, four inches wide, would be very great, even though it were but one-eighth in thickness. The plate would be something in this shape: sideways as in A, or as in the central section B:—



This rough sketch will be sufficient for "Phæton," if he be a carriage-builder. If not, he will have to study one, as I did, in order to comprehend it.

The sketch beneath shows, rudely enough, the present rude mode of getting strength. Judge between the two methods:—



It is rather a far-fetched idea of "Phæton" to liken the roof of a carriage to the roof of his mistress's head. To make the parallel complete, he should comb her hair over her face to the level of her nostrils, and I much mistake, if, after looking at it for a time, he would not in preference "shave it entirely away from her skull." But it is altogether in bad taste to compare an inanimate machine with an animated human being; and this is one reason for supposing that, after all, "Phæton" may really be a builder of carriages. If we take natural inanimate objects, we shall find the converse of "Phæton's" doctrine. A mountain is white on its snowy peak, and dark-coloured below. A tree is dark-coloured in the trunk, and green in the boughs and leaves. But, testing the matter by the rules of architecture, of which carriage-building is one branch, the heaviest-looking portion should assuredly be placed beneath. It was in consonance with this principle that the skirting-boards of rooms were formerly painted black.

"Phæton's" sarcasm on the constructors of the "London Engineer" is fair enough, and I perfectly coincide with him. However, the tinkering people calling themselves "engineers," who

took the construction of that vessel in hand, assuredly did not tread in the steps of Watt and Smeaton. The fact was, I believe, that although most of the London engineers subscribed to it, only one or two quackish people meddled with it. The sublime idea of "churning water in a close box" originated, I believe, with Thomas, Lord Cochrane, under whose direction a vessel called the "Rising Star," was prepared on that most sapient plan, for the purpose of killing and eating the Spaniards in the Pacific. She proved just as efficient as the Greek steam armament. I have a perfect recollection of one circumstance connected with the "London Engineer." The late Mr. * * * * *, who was an exceedingly heavy man, had always refused to interfere with the "London Engineer;" but on one occasion, when the tinkers on board were at a nonplus, after the failure of the air-box scheme to keep the water below its natural level in the iron chambers, they sent for one of his friends first, and then for himself. His friend gave the clerk who went for him especial directions to select the strongest hackney-coach on the stand, and to load him equally between the four springs, lest it should break down with him. He was consequently safely conveyed on board the vessel, which lay alongside the quay. After the consultation was over, one of the engineers was requested to take the draught of water; but as he was somewhat dilatory about it, the reason was asked, when he replied, "I am waiting till * * * * * goes on shore, when she will rise six inches!"

I do not agree with "Phæton" in thinking that, because the present carriages do the work they are put to, there should no further improvement take place. Yet but little will take place till carriage-builders take to studying the principles of science as well as "practical knowledge." It would be worth their while, even in an economical point of view; for at present, when there is any thing out of the common way to perform, they can only get at it by a series of costly experiments.

If the horizontal springs will not answer for steam-carriages—and that is clear enough—by what process does "Phæton" expect the "C springs" to answer, having several motions? I will not attempt to set forth the futility of a plan which must be obvious to every one, The motion of a crank regulated by a piece of pliant leather fixed to a spring, which changes its place of suspension at every jolt!!! The spring-wheel I propose would not have the effect "Phæton" contemplates. If the circular springs all acted alike, the position of the real wheel in the interior would always be the same as regarded the ground, and therefore could not be affected as to progression. The outer, or false wheel, having no centering, would only be an ellipse as regarded the air. Every portion would in turn take the same position on the ground, without causing any extra friction. This is a widely-different thing from an eccentric wheel, which of course would serve as a block to a carriage, and prevent its progression, like running up hill.

The springs might be tinned, without injuring their temper, by means of a soldering-iron. Wherever the plates rubbed together there would, by the very friction, be a preservative against rust. It is precisely because they do not touch that they rust. The rust begins in the hollows.

The proposition to put a steamer in the place of the horses is rather problematical. There must be much weight to give it a hold of the ground, in order to draw the weighted carriage behind it; but I do not altogether despair of such a thing. The turning in a narrow street, with four wheels deep, would be rather awkward. *Mais nous verrons.*

Yours, &c.

JUNIUS REDIVIVUS.

Dec. 20, 1832.

P. S.—I write with no "pugnacious feather," but a "gad of steel."

EXPERIMENTS ON THE NATURE OF HEAT.

(In continuation from p. 199.)

Sir,—In my first communication on the nature of heat, kindly inserted in the last Monthly Part of your useful Journal, p. 199, I endeavoured to show that the heat elicited by the collision of flint and of steel under water was so intense, so instantaneous, and accompanied with such energetic chemical action, as to be identical with electricity. I shall in this endeavour to show that chemical action is always essential to the evolution of heat by mechanical means; and in a subsequent communication I shall pro-

ceed with an attempt to show the real nature of heat, as far as our present limited stock of knowledge extends.

If we strike a piece of common black flint against a similar piece of flint held under water, and examine the dust as before, we shall find minute thread-like sparks, consisting of iron and silex in a state of chemical combination; and hence the iron in the flint, which was insoluble in chlorine, is rendered soluble with the portion of flint combined with it, which was also insoluble previous to the new arrangement thus instantaneously effected.

If we make the same experiment with two pieces of quartz or pure flint, without admixture of iron, we obtain abundant light; but no part of the dust is rendered soluble in chlorine.

If we strew gunpowder dust on one piece of quartz, subjected to the collision of another piece of quartz, we obtain abundant light, but cannot inflame the gunpowder. If also we repeat this ex-experiment with two pieces of clean hard steel and gunpowder, it will not be inflamed by collision. Now, as the same or more force may be fruitlessly employed, must we not conclude that the motion —vibration or rotation—of the particles of the flint and steel is insufficient, without chemical action, to evolve heat, and cannot be its source?

If we attend to the percussion of soft iron we shall find that the iron must be smartly struck to evolve heat—it must be rendered denser, specifically heavier, by the blow; and just so long and only so long as it can be rendered denser, will heat be elicited by percussion, which, soon becoming ineffective, cannot be the source of heat.

In friction, heat is always the result of chemical action. Take, for example, the iron spindle of a heavy millstone in rapid revolution—the circular lower end revolving in oil in a brass step: if the end is of too small diameter—however well supplied with oil—the brass step wears away rapidly, and just as rapidly heat is evolved. If, again, the end is of larger diameter, the brass is uninjured and remains cool, that is, the longer spindle, which has the greatest rubbing surface in the most rapid motion, produces the least heat. Friction, then, independent of chemical action, is not the source of heat.

I am, Sir, your obliged servant,

C. M.

THEATRICALS EXTRAORDINARY.

Sir,—I presume that both you and your correspondents are too much engaged with scientific pursuits and mathematical calculations to be play-goers. It is your happiness—

> " ——— The lab'ring steps to guide
> To virtue's heights; and wisdom well supplied,
> And all the magazines of learning fortified,
> From hence to look below on human kind,
> Bewildered in the maze of life and blind."

I can on no other supposition account for a complaint which has just been made to me by my laborious friend, Ixion. He tells me that in a piece playing at the City Theatre, in which he cuts no inconsiderable figure, he has night after night (for I know not how long) been calling the attention of the mechanical world (that is of you, Sir, and your numerous readers) to the distressing circumstances under which he is placed, but all to no purpose. The piece I allude to is called "The Gentleman in Black," (another name for what is elsewhere, I believe, called "The Loves of the Devils"). Ixion, entering with a pamphlet in his hand, is asked by a philosopher, *warm* in the cause of science—what he is reading? He tells him he is searching the Mechanics' Magazine for a plan to enable him to turn his wheel with the least labour possible. This of course has always elicited thunders of applause from the audience; but as yet not one mark of attention from the Editor of the Mechanics' Magazine, or any of his learned correspondents.

Poor Ixion requested me, as a favour, to communicate this to you the first time I visited the earth, in the hope that you might be induced to set on foot some plan for his relief.

I remain, &c.,

MERCURY.

P.S.—Ixion desired me to tell you, that could pipes of communication be laid between earth and his place of abode, he has no doubt steam could be generated much faster there, and at much less expense, than even by Mr. Perkins new invention.

CANAL NAVIGATION.

Sir,—The opponents of railways are very fond of referring, in support of their views, to the results of certain experiments made upon the Ardrossan Canal at different times in the years 1830 and 1831; and, at first sight, they certainly appear to carry with them great weight. But the

case obviously must undergo a little more sifting before these results can be allowed to be made the foundation of any general argument: their value depends entirely upon the local peculiarities of the canal in question. Before we can measure the amount of influence these experiments ought to have in deciding the question at issue between canals and railways, we ought to be well informed of the circumstances under which the speed of ten miles per hour was accomplished. Are those circumstances, in short, so peculiar that the canal must be considered an exception (as subsequent trials on the Forth canal seem to indicate), or are they so ordinary, that we may expect that the system will be extended to other canals? The writer would therefore be much obliged to any of your correspondents, who may be well acquainted with the line of the Ardrossan Canal, to inform him, through the medium of your very useful journal,—

1st. What the distance is from Glasgow to Johnstone; and what is the average time consumed in the passage between those two places?—2d. How many locks or sluices intervene, and what is the average loss of time at each?—3d. What is the tonnage annually passing along the canal; and how often, either at the locks, the tunnels, or the aqueducts, the slowly travelling boats impede the progress of the fast boats? Whether the price of the horses be not considerably higher, and their duration very much diminished?

A YOUNG SUBSCRIBER.

Canons, Middlesex, Jan. 12, 1833.

MR. BABBAGE.

Sir,—I do not agree with "Junius Redivivus" in one half that he has written in reference to the gentleman above-named. "Junius" frankly acknowledges that the years he has numbered are "not many." I believe him. Much as I admire his talents on some occasions, I must say that in his paper, pages 233—240, he has manifested decisive symptoms of "zeal without knowledge."

Science and politics are not, perhaps incompatibles; but, generally speaking, I think they have very little affinity. The less we have of politics in the Mech. Mag., the more acceptable will be its pages to the majority of readers; and the less there is of politics mixed up with the proceedings of Mechanics' Institutions, or other scientific societies, the more prosperous, do I conceive, will be their affairs, and the more extended and beneficial their influence.

I am not averse to the general diffusion of political knowledge: on the contrary, I hold that man to be only half-informed in secular matters, whatever may be his acquirements in other respects, who is ignorant of those fundamental principles on which are founded, or on which *ought to be* founded, the civil institutions that adorn his own and other countries. But as there is a "time," so let there be a place and an occasion "for all things." Let not science and politics be associated. Science has fact and experience for its supporters—politics consist, for the most part, of discordant opinions.

I should like to know what "Junius" means by "moral science." From some of his reasoning, if reasoning it may be termed, "Junius" seems to infer, that because Mr. Babbage *is* a good mathematician, and a scientific machinist, and because he *is not* up to all the secrets of the "bookselling trade"—the "truck system"—and the art of "copying"—therefore his knowledge of every other subject must, necessarily, be exceedingly limited, and, consequently, that he is wholly unfit for the business of legislation.

If "Junius" means any thing by his favourite epithet, "moral science," I suppose it must be that the man who aspires to legislative honours must know *every thing*. Such expectations may do very well for Mr. Owen's Utopia, but I reckon that "Junius" will number many more years before his wishes or his anticipations will be realised. Even the "three hundred," though "chosen by the whole nation, from amongst the best and wisest men of the nation, maintained by the nation, and *responsible* to the nation," would be found to fall very far below the "moral science" standard that "Junius" professes to set up. I know nothing of Mr. Babbage beyond that which is known to others, as well as myself, by his works, and the public prints. I should, however, take him to be quite as well adapted for a legislator as one-half, or perhaps two-thirds, of those who have recently acquired that honourable distinction. I

will go a step further. If extensive knowledge, blended with liberal and enlightened views—if active habits and unwearying perseverance, be considered as valuable qualifications in those who constitute the council of the nation—then is Mr. Babbage much better fitted to occupy a seat there than many who will in a few days enjoy that privilege. It is not essential that every member of parliament should be a mathematician, or a machinist, or an author; but it is desirable and important that he should be a man of sense and discernment. I don't understand why "Junius" has made a "stalking-horse" of Mr. Babbage, excepting it be that he wished to display a little of his own dexterity. If that were the motive, I wish "Junius" joy of his ride—and I have no doubt Mr. Babbage joins with me in the wish.

J. O. N. RUTTER.

Lymington, Jan. 10, 1833.

MEDAL ENGRAVING.

Mr. Bate observes a notice of his son's improvement on medal-ruling in the Mechanics' Magazine of the 29th ult., and thinks it will give the Editor pleasure to learn that Mr. John Bate has never disputed the American claims to the invention, further than quoting the "*Manuel de Tournure*," as the Editor himself does in the commencement of his article, nor is Mr. Bate aware that he has been "invited to disclaim acquaintance with disclosures made by Mr. Spencer, when in London."

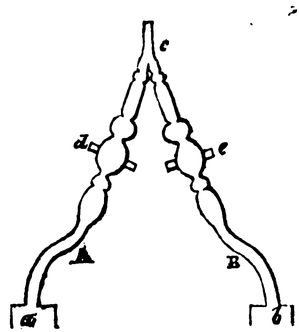
All that Mr. John Bate claims is the merit of having completely got rid of the distortion, so well described by the Editor of the Mechanics' Magazine, without diminishing the effect of the relief, and Mr. Bate assures the Editor that this is done in a manner entirely original, and palpably different from the means employed by Mr. Spencer, of which neither Mr. Bate nor his son know any thing but what they have collected from the inspection of the specimens themselves.

No. 21, Poultry, Jan. 17, 1833.

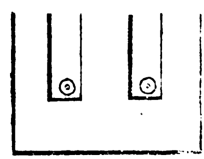
CHEAP OXY-HYDROGEN APPARATUS.

Sir,—I anticipate one objection to the general adoption of my improved blowpipe, viz.—its expense.

The following simple arrangement I submit for the benefit of those who cannot afford to purchase a more costly apparatus.



The jets *a b* are those I attach to my copper vessels. As respects their internal structure, they are wholly independent of each other. They are united at *c*, simply to keep them steady, and to bring the gases into the most complete contact at the point of combustion. These jets may be formed entirely of brass. It is usual to use platina at the extremity beyond *c*, but it is an unnecessary expense in the present instance. Let two large bladders,* one filled with oxygen gas, the other with hydrogen, be adapted by proper stop-cocks to the jets at A and B. Provide a box of sufficient capacity to contain the bladders, and notch one end of the box thus:—



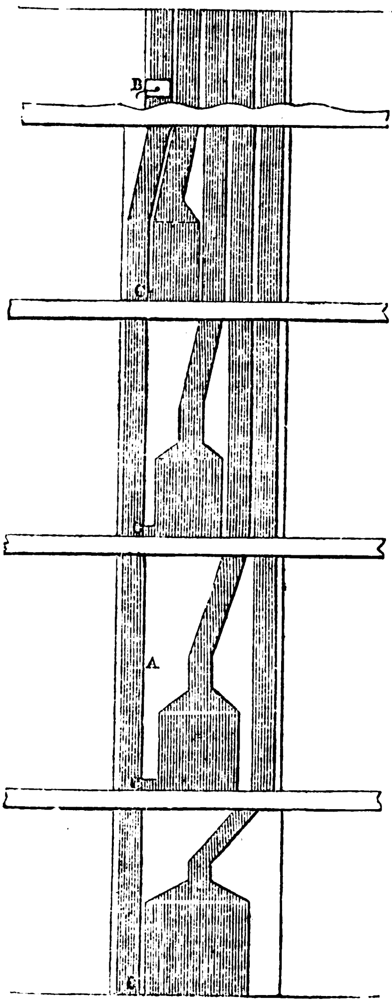
so as to permit the necks of the bladders to protrude. Upon the bladders place a stout board—say half inch less area than the box, and moving freely within it. If the board be loaded with a heavy weight—one or two half cwts. for instance—a very powerful instrument will be obtained, by which the most striking experiments may be exhibited with great effect, and in perfect security. The relative quantities of gas are easily obtained by the adjustment of the stop-cocks *d* and *e*. To prevent mistake, it would perhaps be advisable always to use the same jet for the same kind of gas.

J. O. N. RUTTER.

Lymington, Jan. 8, 1833.

* I have occasionally obtained bladder which would contain 800 or 900 cubic inches of gas.

HOUSE-TOP DEFORMITIES—NEW MODE OF CONSTRUCTING CHIMNEYS.



Sir,—Having noticed in your valuable Magazine, last volume, page 316, the remarks of C. D. S. on house-top deformities, I agree with him that the terminations of our chimneys are most disgraceful to the architectural taste of the metropolis. Such incongruous absurdities should not be tolerated one moment; the more especially as, in general, they only aggravate the evil they were intended to remove. Having had some little practice in rectifying the nuisance of smoky chimneys, I can state from experience that, in nine cases out of ten, the fault does not lie at the top of the chimney, but at the bottom. Indeed, what with bad construction, and other causes, we might almost think it impossible for the smoke to ascend at all. We all know that, during the process of combustion and respiration, a great quantity of air is consumed or dissipated, and of course there must be a supply equal to the expenditure. I would ask where is the supply to come from? The doors and windows are fitted so exactly, that it is impossible for it to come from them, unless they are opened. In a general way, where there is a chimney in a neighbouring room, with doors folding or otherwise between the two—and they mostly open—it comes down the flue of the one in which there is no fire, and brings with it the smoke of any flue (it may be from the kitchen) which is passing over it at the time, with a strong effluvia of whatever may be cooking at the fire; or where the room is quite separate, with only one door into it from the passage, &c., the door and window being both shut, the current comes down the same flue by which the smoke ascends, and brings it out into the room. These are the evils. Now I would suggest, as a remedy, the propriety of building an air-flue when any fresh stack of chimneys is built, which I consider would be attended with very great advantages in ventilating a building, as well as in a great many instances obviate the cause of smoke coming into the room. I would build it in one of the jambs, from the basement to the top of the stack; and at the back corner of each fire-place I would leave an opening, which would supply the waste occasioned by the fire or respiration; and, as the draft would be down the air-flue, I would cover in the top, and make an aperture in the side, to prevent the smoke which may pass over it from being drawn down with the current.

The prefixed section (on a scale of one-eighth of an inch to a foot) of a stack of chimneys, will perhaps explain what I mean much better than words. The manner in which I propose the flues to be constructed is different from the usual practice, the reasons for which will be stated at a future period, should this communication be deemed worthy of insertion. A is the air-flue; B aperture in the shaft above the roof; C C C C apertures into the fire-places.

I believe, if this plan were adopted, we

should not have our chimney tops any longer disfigured with the most unsightly objects which fable yet has feigned, or whim conceived.

I am, Sir, yours respectfully,
A Bricklayer.

LETTER-COPYING.

Sir,—Mr. Babbage, in his work on the "Economy of Machinery and Manufactures," page 57, describes two modes of copying letters, thus:—

"In one of the modes of performing this process, a sheet of very thin paper is damped, and placed upon the writing to be copied. The two papers are then passed through a rolling press, and a portion of the ink from one paper is transferred to the other. The writing is of course reversed by this process, but the paper to which it is transferred being thin, it is visible on the other side, in an inverted position. Another common mode of copying letters is by placing a sheet of paper, covered on both sides with a substance prepared from lamp black, between a sheet of thin paper and the paper on which the letter to be dispatched is written. If the upper or thin sheet be written upon with any hard-pointed substance, the words written with this style will be impressed upon the black paper and upon both those adjoining it. The translucency of the upper sheet, which is retained by the writer, is in this instance necessary to render legible the writing which is on the back of the paper. Both these arts are very limited in their extents, *two* or *three* being the utmost number of repetitions they allow."

As respects the last-mentioned process, I must take leave to differ from Mr. Babbage. He is certainly in error. The number of repetitions, instead of being limited to *two or three*, may, if the carbonic sheets are properly prepared, be very conveniently extended to *fifteen or twenty*. For several years I have used "Wedgewood's Manifold Writer," and I think if its merits were more generally understood it would be more extensively employed. Without the aid of a common pen, or ink, a letter and its copy are simultaneously written. The original is retained in the letter-book,—the copy dispatched to the correspondent. Among the advantages of copying letters by this apparatus, not the least important is secrecy.

J. O. N. Rutter.

Lymington, Jan. 11, 1833.

P.S.—The above is not expensive. It is both useful and elegant.

THE EIGHTH PROPOSITION OF THE FIFTH BOOK OF EUCLID.

Sir,—I have been a constant reader of your interesting Magazine from its first commencement. To the part devoted to pure and mixed mathematics I have always paid the greatest attention. I have myself, Mr. Editor, been a teacher of mathematics, &c., for these last twenty years; it may, therefore, be expected that I ought to know something of the science by this time. I have observed that many of your ingenious contributors have upset propositions, the truth of which never had been before questioned. None of them, however, have ventured to doubt the truth of any of the propositions of Euclid: to do so might perhaps be considered downright insanity, after having stood the test of 2,000 years. Well, this notwithstanding, there is one proposition in Euclid the truth of which I do not intend to dispute, but the demonstration given for which I have never, I must confess, been satisfied with. I allude to the 8th proposition of the 5th book, which is by far the most difficult proposition of any in the six books. The first part of the demonstration, as given by the late illustrious Professor Playfair, is as follows:—

Let A and B be a magnitude greater than A and C, a third magnitude; $A+B$ has to C a greater ratio than A has to C, and C has a greater ratio to A than A has to $A+B$. Let m be such a number that mA and mB are each of them greater than C; and let nC be the least multiple of C that exceeds $mA+mB$, then $nC-C$, that is $(n-1)C$, will be less than $mA+mB$, or $mA+mB$, that is $m(A+B)$ is greater than $(n-1)C$, &c.

Now, my objections to the above reasoning are these:—Although nC is the least multiple of C that exceeds $mA+mB$, I deny that it always follows that $(n-1)C$ is less than $mA+mB$. They may, in truth, be equal; as may be easily seen by an appeal to arithmetic:—

$$\text{Let } A=8,\ B=1,\ C=18,$$
$$\text{then } 8+1:18 > 8:18,$$
$$\text{Assume } m=20 \text{ and } n=11$$
$$\text{Then } mA+mB=160\times20=180$$
$$\text{and } nC=18\times11=198$$
$$\therefore (n-1)C=18\times10=180$$

Hence, according to the above numbers, $(n-1)C=m(A+B)$.

If any of your able correspondents will

have the goodness to clear up this matter, they will much oblige

A COUNTRY TEACHER.

PERMANENT BLACK CLOTH.

Sir,—As black is a colour now in such general wear, both for morning and evening coats, and as there is a very great difference in the quality of this colour, according to the process made use of in dying it, it may perhaps be useful to some of your readers to know how to distinguish permanent genuine colours, dyed in the wool, from false or spurious ones dyed in the piece—the former having received a ground or preparation of indigo blue, which is a fast and permanent dye, and can alone insure a sound colour—the latter, or piece-dyed colour, being almost entirely composed of logwood, combined with the sulphates of iron and copper, and is a false and fugitive shade—in fact, merely a stain upon the cloth.

The Test.—Put about a tea spoonful of oxalic acid into a small phial, and add as much water as will dissolve it; shake the mixture till the chrystals disappear, then moisten the cork three or four times with the acid solution, and press it smartly upon the cloth to be examined; in a few minutes a spot will appear upon the part the cork has pressed, which, if indigo has been used as a base or ground to the colour, will be of a greenish olive shade; but if no indigo has been employed, and the colour is composed wholly of logwood and the sulphates of iron and copper, the spot will change to a dusky orange or fawn colour, and a black so dyed will fade on a few weeks' exposure to the sun and air, and turn to a dingy slate colour. The wool-dyed black, upon an indigo ground of proper depth, improves by wear and exposure to oxygen, and preserves a good full shade till the cloth is entirely worn out. This I have proved by experience. Many other acids will produce similar effects in detecting false colours, but I prefer the oxalic, being the most easy and quickest in operation.

I remain, Sir, your obedient servant,

CHEMICUS.

Bath, Jan. 17, 1833.

N.B.—The above test will do for many other colours as well as black, and will show where indigo has been used by the greenness of the spot. The depth of blue given to a colour will be seen by the darkness that remains after the acid has been applied.

Statistical Sketches of Upper Canada, for the Use of Emigrants.—By a BACKWOODSMAN. 120 pp., 18mo., Murray.

We have not been often more amused by a matter of statistics, than by the cheap little book now before us. Although the "sketches" are styled "Statistical," they have none of the dryness which commonly appertains to that class of productions, but are on the contrary exceedingly lively and entertaining, and contain, at the same time, a great deal of very original and valuable information. The "Backwoodsman," who has on this occasion laid aside the rifle for the pen, seems to be a rare fellow—a man of the world as well as of the woods—a lover of society as well as of nature—a scholar, soldier, sportsman, farmer, and man of business—a great traveller, a great observer, a great humourist, and altogether a great acquisition to the new country where he has taken up his abode—to all appearance for better and for worse. His personal acquaintance too with the province, the statistics of which he has undertaken to elucidate, is such as few men on either side of the Atlantic can boast of.

"As for my qualifications to give information relative to this province, I have only to state that it is now nearly twenty years since I first came to this country, having served here during the war, in the years 1813, 1814, and 1815; and since the year 1826 my principal employment has been to traverse the country in every direction, and visit nearly every township in it, for the express purpose of obtaining statistical information. If, therefore, the reader will only be pleased to allow that my judgment is equal to that of the ordinary average of mankind, it must be pretty evident that I have sufficient knowledge for the undertaking; and I, on my part, can assure him or her (for I am in hopes I shall have both sexes for readers) that I will, according to the formula of the oath, speak the truth, the whole truth, and nothing but the truth. So help me GOD."—*Introduction.*

Almost the only thing in which the author is deficient—with a view to the particular task he has undertaken—is a knowledge of the established principles of political economy; but the first words of his first chapter contain so frank a confession on this head, as to make all further criticism superfluous. "I am no great dab," he says, "at Political Econo-

my;" and on this subject "avowedly ignorant." When the reader therefore meets, in the course of his perusal of these Sketches, with any economical dogma, of a particularly startling description—such as, that it is for the *benefit* of the British people that they pay a higher price for the worst Canadian timber than for the best Memel—he has but to bear in mind that, as to the matter *dabbled* in, the author is avowedly "no great *dab*," and may even know less than he supposes.

The principal subjects treated of in his Chapters are—the description of emigrants most wanted in Upper Canada—the preparations proper to be made by emigrants—the course best to be pursued on landing at Quebec—the climate, soil, and productions of the province—its lakes, rivers, canals, roads, &c.—the farming practices of the settlers—their field sports—lumber trade—religious sects, &c. On all these points the author writes with great shrewdness and ability; and will be found a valuable and unexceptionable guide to all intending settlers. We shall extract at random a few specimens.

The sort of persons who are most likely to prosper as emigrants:—

"Mechanics and artizans of almost all descriptions—millwrights, blacksmiths, carpenters, masons, bricklayers, tailors, shoemakers, tanners, millers, and all the ordinary trades that are required in an agricultural and partially ship-owning and commercial country, will do well to come to Canada. Weavers have but little to expect in the way of their trade, though such of them as are employed in customer-work can make from ten to twelve shillings a day; but they soon make good farmers. A friend of mine asserts that they make better farmers for this country than agricultural labourers, alleging as a cause, that, as they have no prejudices to overcome, they get at once into the customs of the country as copied from their neighbours, and, being in the habit of thinking, improve upon them. But my friend is from Paisley, and consequently prejudiced in favour of weavers. However there is no denying that the weavers from Renfrew and Lanarkshire in the Bathurst district are very good and very prosperous settlers; and that the linen weavers from the North of Ireland make the best choppers, native or imported, in the province, as they to a man can chop with either hand forward, and by changing their hands they relieve themselves and obtain a rest. This ambidextrousness is ascribed by their countrymen, how justly I know not, to their habit of using both hands equally in throwing the shuttle. Of these trades the blacksmith, tailor, and shoemaker are the best. If there were in nature (which is doubtful) such a being as a sober blacksmith, he might make a fortune. One exception, however, there is in the case of mechanics. First-rate London workmen will not receive such high wages, either positively or relatively, as they would at home—for this reason, that there are few on this continent who either require or can afford work of the very first order, and those that do send to London for it."—pp. 7, 8.

Climate of the Canadas:—

"It has never been accountable to me how the heat of the sun is regulated. There is no part of Upper Canada that it is not to the south of Penzance; yet there is no part of England where the cold is so intense as in Canada; nay, there is no cold in England equal to the cold of Virginia, which, were it on the European side of the hemisphere, would be looked upon as an almost tropical climate. To explain to an European what the climate of Upper Canada is, we would say that in summer it is the climate of Italy, in winter that of Holland; but in either case we should only be giving an illustration, for in both winter and summer it possesses peculiarities which neither of these two climates possess. The summer heat of Upper Canada generally ranges towardr 80° Fahr., but should the wind blow twenty-four hours steadily from the north it will fall to 40° during the night. The reason of this seems to be the enormous quantity of forest over which that wind blows, and the leaves of the trees affording such an extensive surface of evaporation. One remarkable peculiarity in the climate of the Canadas when compared with those to which we have likened it, is dryness. Far from the ocean, the salt particles that, some how or other, exist in the atmosphere of sea-bounded countries, are not to be found here: roofs of tinned, iron, of fifty years standing, are as bright as the day they came out of the shop; and you may leave a charge of gunpowder in your gun for a month, and find at the end of it that it goes off without hanging fire."—pp. 28, 29.

Of rifles:—

"If you have a rifle you may just as well bring it, or if you have plenty of money, you may buy one from Nock, who is the best maker in London; but if you have a good town-made double barrel, a rifle is unnecessary, as a little ball prac-

tice will enable you to put a ball into a playing card at thirty-five or forty paces, and that is as far out as, during the greater part of the year, you will ever see deer; and by loading one barrel with shot and the other with ball or buck-shot, you are *in utrumque paratus*. In India, the deer and tiger hunters have long exchanged the rifle for the Manton, which from practice they use with equal precision and much greater quickness. There were, in the year 1818, three officers in one cantonment, any one of whom would have taken a bet of three to one that he would hit a cricket ball, bowled away, with a single bullet. If, however, you prefer the rifle, you can get them in this country, coarsely finished to be sure, but perfectly true and cheap, at from 5*l.* to 15*l.* currency."—p. 37.

The canals of the Canadian provinces form, with the aid of their vast lakes and rivers, an inland navigation of nearly 1,500 miles in extent. Of the Rideau Canal, which has been lately completed, the author observes:—

"The Rideau canal is the principal branch of this splendid navigation through the interior of these provinces—a navigation which, among other benefits, brings into connexion with the markets of Montreal and Quebec (estimating the depth of two townships on each side of it) three millions of acres of arable land, which were either partially or totally shut off from communication, and, for any thing that the country gained by them, the greater part might as well have been totally barren. The principle on which this work has been carried on, as far as extent at least goes, is new in engineering: the rivers and lakes are raised, at different points, to the levels required, by immense dams, some of which must sustain a pressure of an atmosphere and a half at the base, and by these means excavation to an enormous extent is saved. It commences at Kingston and ends at Bytown. The distance between these two points is as yet not quite accurately ascertained, but is believed to be about 130 miles."—p. 60.

Of the conciliatory and tranquillising effects of an equal and beneficent system of government we have the following striking exemplification:—

"The Catholics are by far the most devotedly loyal subjects his Majesty has in Canada. It is well known that, during the war, Ogdensburgh was taken by the gallant charge made, under a heavy fire from the enemy's batteries, by the Catholics of Glengarry, *headed* by their priest, the Rev. Alexander M'Donnel, now Catholic Bishop of Upper Canada; and a very large proportion of General Brock's army, who took Detroit, were the French Catholics of the western district, fighting, be it remembered, against their brethren of the United States frontier. The Irish Catholic is by far the easiest conciliated of any emigrant who comes to this province; for at home, being habituated to oppression, and looked upon as a helot, he considers simple justice a favour; and when, on his arrival here, he finds that he is emancipated in spirit as well as in letter—that he is admitted into the Legislative Council, the House of Assembly, and the Magistracy, if his rank or talent entitle him to such a distinction, as a matter of course—and that there is no prejudice that condemns those of his faith to be degraded in the eyes of their fellow-subjects, as if of a lower order of the human family—he feels his heart overflow with gratitude to the Government under which he lives, and forgets in a moment the wrongs that he and his ancestors have suffered for ages."—p. 99.

We shall conclude with an extract, which throws some further light on the personal history of our clever "Backwoodsman." We are sorry to perceive from it that, well as he deserves of the country which he has so ably described, and of all who are interested in its colonisation, the only proofs of public gratitude which he is able to enumerate, are "privation, thankless toil, and a broken constitution." We should conclude, from this, that he must be an officer of the same enlightened, liberal, and judicious company which made a sacrifice of the ingenious Mr. Galt, because he could not, all at once, convert trackless forests and plains of rushes into rubies and diamonds.

"It is only since writing the above that I fell in with the first volume of Moore's life of Lord Edward Fitzgerald; and I cannot describe the pleasure I received from reading his vivid, spirited, and accurate description of the feelings he experienced on first taking on him the life of a hunter. At an earlier period of life than Lord Edward had then attained I made my *debût* in the forest, and first assumed the blanket coat and the rifle, the mocassin and the snow shoe; and the ecstatic feeling of Arab-like independence, and the utter contempt for the advantage and restrictions of civilisation, which he then describes, I felt in its fullest power. And even now, when my way of life, like Macbeth's, is falling 'into the sere, the yellow leaf,' and when a tropical climate, privation, disease, and thankless toil

are combining with advancing years to unstring a frame the strength of which once set hunger, cold, and fatigue at defiance, and to undermine a constitution that once appeared iron-bound, still I cannot lie down by a fire in the woods without the elevating feeling which I experienced formerly, returning, though in a diminished degree. And this must be human nature: for it is an undoubted fact, that no man who associates with, and follows the pursuits of the Indian, for any length of time, ever voluntarily returns to civilised society."—p. 51

NOTES WORTH NOTICE.

"Observation is the science upon which all the rest are built, and every new fact adds a brick to the foundation."

The Penny Press in Ireland.—The sister kingdom has at length its representative in cheap literature, in the shape of the *Dublin Penny Journal*, a weekly periodical which need not blush to find itself on the same shelf with the best of its English brethren. In size and general arrangement it closely resembles the Useful Knowledge Society's *Penny Magazine*, which it rivals in the number and quality of its embellishments, and far exceeds in the elegance of its typography. The contents bear a general reference, as they ought to do, to Irish topics, but with a most judiciously rigid exclusion of that terrific bugbear—Irish politics. To add to the interest of the work, the engravings in some of the Numbers are from drawings by a journeyman-painter of Drogheda, Mr. Armstrong, (a name which will, perhaps, not remain much longer in obscurity,) who, we are informed by the Editor, by passing his leisure hours in study instead of low dissipation, like the great majority of his class, has learned "to sketch like an artist, and write like a gentleman"—a fact of which the Numbers of the journal in question afford ample proof. The work, we are inclined to believe, is edited by Mr. Hardiman, a gentleman who has honourably distinguished himself by his "Irish Minstrelsy," "History of Galway," &c., and who will, it is to be hoped, not have much longer to observe, that "the proprietors of the journal have not yet divided a single penny of profit among them."

High Wages.—It is on record that, in the time of Edward III., the wages of a master-mason, or carpenter, were fourpence per day; and of his journeymen, twopence or threepence, according to merit.

Steam Communication with India.—It may be recollected that, in a "note" some time back, the establishment of a rapid communication between India and England, by means of steam-vessels navigating the Red Sea and the Mediterranean, was confidently anticipated. The present year was to witness the commencement of the effort, it having been announced that the Company's steamer, Hugh Lindsay, would start with letters from Bombay on the 1st of January; while it was expected the Government steamers to Malta would be ordered to proceed to Alexandria to receive the mail after its transmission across the Isthmus of Suez. All this is now at an end! The East India Company have not only refused any future co-operation, but have actually extinguished the present plan, by sending out orders that the Hugh Lindsay shall not be dispatched to the Red Sea! The excuse is, the great expense; but is this excuse worthy of a great commercial Company, when the expense, however great, is put in the scale with the greatly-increased celerity of communication?

The New House of Commons.—It was expected that the first reformed House of Commons would include a far greater proportion than usual of scientific Members; but that expectation has been disappointed. Mr. Babbage has lost his election for Finsbury; his friend, Mr. Lubbock, did not even go to the poll for Cambridge; and Dr. Birkbeck declined being put in nomination for one of the new metropolitan boroughs. The only new Member of any note in the scientific world is Mr. N. A. Vigors, the eminent naturalist, and Secretary to the Zoological Society, who was returned for an Irish county, not at all, however, on the ground of his scientific merits, but because he pledged himself to a thick-and-thin support of all the great Agitator's anti-Union measures. Of the old Members, Colonel Torrens secured his election; but Mr. Jephson, of Mallow, the most active man of science in the House, was unseated; and Mr. Holdsworth, of Dartmouth, we believe, retired. If the comparison were made with regard to literary characters, the result would be similar.

An Old New Invention.—The present fashionable mode of warming buildings by means of hot water, appears to have been not unknown to the Romans. In "A Tour through Great Britain," published nearly a century ago, an account is given of the digging-up of a Roman bath in Herefordshire, the floor of which was partly composed of pipes and hollow tiles, evidently intended for the passage of hot water. On this discovery the celebrated antiquary, Dr. Stukeley, remarked, "This would be a most excellent invention to in-

roduce among ourselves for the warming of apartments in the winter season." The worthy Doctor's hint, however, appears not to have been taken till some five score years after he threw it out.

Colonial Improvements.—The progress of improvement in our colonies does not slacken. In Ceylon, the English stage-coach lately introduced now runs regularly thrice a week between Colombo, the capital, and Candy, the chief town of the interior; and preparations are on foot for running it daily, if increased facility of communication should be required. A road is also forming from Candy to Trincomalee, so as to complete the line from the capital to the opposite coast. In Van Diemen's Land they are not less active: the latest improvement is the adoption of street lamps in Hobart Town, which, with the lights in the shops, make the town present, according to the newspapers published there, a very brilliant and lively appearance.

Early Printing.—The art of printing appears to have been applied, very soon after its introduction in England, to the promulgation of the statutes. The earliest printed collection of the laws is an alphabetical abridgment of the statutes, both before and after the time of Edward III., in Latin and French. The latest Act included is one of the 33d year of Henry VI. (1455), and the collection is supposed to have been published previous to 1481. The printers were Lettou and Machlinia.

Room for the March of Mind.—It gives us a melancholy idea of the state of literature in Ireland, when we are informed, that in the large seaport town of Galway, which numbers upwards of 50,000 inhabitants, there is not a single printing-office or bookseller's shop!

Steam-Carriages, Past and Present.—The first steam carriage for common roads, or, at least, the first which attracted any public attention, was one invented by a Julius Griffith, Esq., in 1821, and shortly after patented, not only in England, but, expressly on account of the "*universal* importance" of the invention, in America and *Austria* also! In the flourishing accounts of the invention published at the time, the world was informed, something in the style of more recent announcements, although in not quite so inflated a key as we have been since accustomed to, that "*all obstacles* on account of hills, &c.," were removed—that it was "destined to carry three tons of merchandise at five miles an hour, or 100 per day," at "25 per cent. cheaper" than horse conveyance; but, above all, that "by *the distribution of steam into tubes,* explosion was rendered unimportant!"* Yet all this came to nothing, and that, too, it is now said, on account of the construction of this wonderfully-improved boiler. A carriage was actually built upon the plan of Mr. Griffith, but, we believe, never made any journey beyond the precincts of the engineer's yard in which it was constructed, where its performances were so perfectly satisfactory that every body who saw it agreed that horse-flesh must soon be quite at a discount. Steam-travelling has since made some progress, but our speculators in the line are still quite as fond of doing wonders by anticipation as their predecessor. If they only effect one-half what they talk of doing, it will be "passing well!"

F H.

ANSWERS TO INQUIRIES.

AREAS OF CIRCLES.—The pressure required in the case of the engine mentioned by "Tyro Mechanicus" will be about 44lbs. per square inch. Tables of the areas of circles (the want of which T. M. states has led to his present inquiry) are given in several scientific works; but the best of all perhaps are contained in a little work, but too little known, which was published at Bolton some seven or eight years ago, and compiled we believe by a gentleman of the name of Todd, though sent forth anonymously. The Bolton work to which we allude gives the areas and circumferences of circles of different diameters—*from one inch to a hundred inches, advancing by an eighth only,*—besides a number of other very useful practical tables.

BLANKETS were so named after their first manufacturer. A very curious list might be formed of ingenious mechanics and manufacturers whose names have been thus immortalised.

MACHINERY IN MODELS.—We would advise N. S. not to be too sure. It by no means follows, that because his invention works well in a model, it would answer equally well on a large scale. It was long ago remarked by Galileo, that "what appears very firm and succeeds very well in models may be very weak and infirm, or may even fall to pieces *by its own weight,* when it comes to be executed in large dimensions according to the model."

ARCHITECTURAL DRAWING.—"A Subscriber," at York, will find the Principles of Geometrical Construction treated of in a more practical spirit, and at greater length, in Mr. Peter Nicholson's "Builder and Workman's New Director," than in any other English work with which we are acquainted. He may also consult, with advantage, the English translation of Dupin's "Mathematics practically applied to the Useful and Fine Arts."

CASK MANUFACTORY.—We believe S. V. E. will find the field quite clear. There was once a Cask Manufactory established at Glasgow, (if we are not mistaken, by Mr. Brown, the inventor of the Gas Vacuum Engine,) but it has been long since abandoned.

* Precisely the same thing was confidently asserted by Mr. Walter Hancock of *his* boiler when examined by the Parliamentary Committee. A few months after it burst, and killed the engineer!

COMBUSTION FROM PERCUSSION.—We have no doubt that W. L M. E. puts the right construction on the term "direct percussion," as used by Mr. Beckford; and beg to refer him, for a curious speculation on the source of the heat thus developed, to a paper by C. M. in our present number.

HOT AIR STOVES.—The insalubrity of "air heated by an iron stove and pipe," is sufficiently proved by the feeling of depression on the lungs, which is always experienced in apartments so heated. If Mr. Feddon, however, will place an open vessel filled with water on the top of his stove, the evaporation from it will supply that moisture, the want of which is the source of the evil. The previous enquiry on the subject to which Mr. F. alludes, never reached us.

MISCELLANEOUS.

Volcanic Islands.—A very brilliant representation in miniature of the manner in which such volcanic groups of islands as the Azores emerged from the ocean, may be produced by immersing a bottle of phosphuretted hydrogen in the water of a pneumatic cistern, and then removing the cork. As the bubbles of gas rise to the surface and come in contact with the open air, they instantly take fire, and exhibit the appearance of so many cones of flame ascending spontaneously from the midst of the water.—C.

Inspiration of Chlorine.—The *Annales des Mines* states, that the most effectual protection against the danger to be apprehended from the inspiration of chlorine is to breathe the vapour of spirits of wine, or to swallow lumps of sugar steeped in alcohol.

Sewing on Glazed Calico.—By passing a cake of white soap a few times over a piece of glazed calico, or any other stiffened material, the needle will penetrate with as much facility as it will through any other kind of work. The Patronesses of the School of Industry pronounce this to be a fact worth knowing, the destruction of needles in the ordinary way occasioning both loss of time and expense.—*Taunton Courier.*

Burning Springs.—Ten miles south of Fort Plain, on the Erie Canal, 42 miles west of Shenectady, there is a spring of water which has all the appearance of a stream of living fire, even by daylight. The flames are caused by the evolution from the water of large quantities of sulphuretted hydrogen gas, which instantly ignites on coming into contact with the open air. There is a similar spring on the Canada side of the Niagara.—C.

LIST OF NEW PATENTS GRANTED BETWEEN THE 23D OF DECEMBER, 1832, AND 22D OF JANUARY, 1833.

William Henson, of Worcester, lace-manufacturer, for certain improvements in machinery for producing lace in various breadths, with edges or quilling. To enrol within Six Months from the 26th of December, 1832.

William Henson, of Worcester, lace-manufacturer, for certain improvements in machinery for manufacturing bobbin-net laces. Six Months; Dec. 26, 1832.

William Greatrix, of Salford, silk dyer, for an improved method of imparting to various woven fabrics, or to the yarns or threads of which the same are intended to be composed, the colour necessary to form the required patterns thereon. Six Months; Jan. 5, 1833.

John Reynolds, of Oakwood, near Neath, ironmaster, for an improved engine and apparatus to be worked by steam and other motive power. Six Months: Jan. .

William Thomas Shallcross, of Holt Town, Manchester, mechanic, for certain improvements in looms or machines for weaving cotton, linen, silk, woollen, and other fibrous cloths and substances. Six Months; Jan. 9.

Samuel Hall, of Basford, Nottinghamshire, cotton-manufacturer, for an improved method of lubricating the pistons, piston-rods, and valves or cocks of steam-engines, and of condensing the steam of such engines as are worked by a vacuum produced by condensation; also a method of condensation applicable to other useful purposes. Six Months; Jan. 9.

Joseph Gibbs, of the Kent-road, Surrey, engineer, for certain improvements in the processes of dressing or preparing hemp, flax, New Zealand flax, and other vegetable fibrous substances, to render them fit for spinning, paper-making, and other purposes. Six Months; Jan. 9.

Thomas Moore Evans, of Birmingham, merchant, for an invention, communicated to him by a certain foreigner residing abroad, for improvements in machinery of preparing and dressing flax, hemp, and other fibrous materials. Six Months; Jan. 10.

Samuel Parker, of Argyle-street, Middlesex, bronzist, for certain improvements in apparatus for making extracts from coffee and other substances. Six Months; Jan. 11.

William Harrold, of Birmingham, merchant, for an improvement or improvements in machinery for making or manufacturing paper; communicated to him by a foreigner residing abroad. Six Months; Jan. 11.

Walter Hancock, of Stratford, Essex, engineer, for an improvement or improvements upon steam-boilers. Six Months; Jan. 15.

Alexander Clark, of Bagille, in the parish of Holywell, county of Flint, for certain improvements in blowing-machines. Six Months; Jan. 15.

Robert William Sievier, of Southampton-row, St. George, Bloomsbury, gentleman, for an improvement or improvements in the making or manufacturing of elastic goods or fabrics applicable to various useful purposes. Six Months; Jan. 17.

Thomas Affleck, of Dumfries, for certain improvements in the means and machinery for deepening and excavating the beds of rivers, removing sand-banks, bars, and other obstructions to navigation. To enrol within six months; and to extend to the Colonies and Plantations abroad. Jan. 19.

James Macdonald, of the University Club House, Pall Mall East, gentleman, for an improvement or improvements in the construction of bridges made of iron or other materials; which invention is also applicable to other useful purposes. Six Months; Jan. 22.

INTERIM NOTICES.

Mr. Shalders has sent us a letter on the subject of his Pump, which it will be but justice to him to insert; the more especially as, in a note accompanying it, he protests against being held responsible for what his agent, Mr. Beare, has chosen to publish on the subject. We shall endeavour to find room for it next week.

"Audax" may please himself; we left nothing out of his letter, except two or three sentences, which, as written, were wholly unintelligible.

Communications received from R—Dr. Vetch—Mr. Thomas—A Cabinet Maker—Aquarius—J. N. B.—An Agriculturist—Mr. Ballingall.

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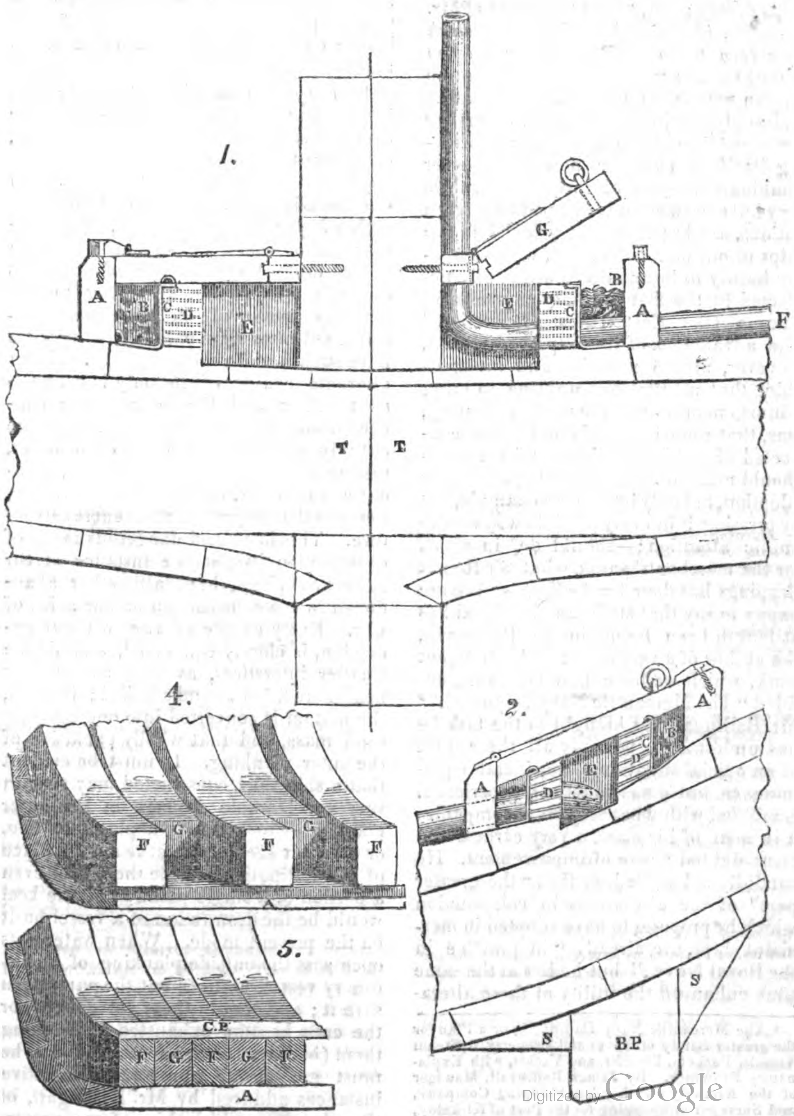
BALLINGALL'S IMPROVEMENTS IN SHIPBUILDING.



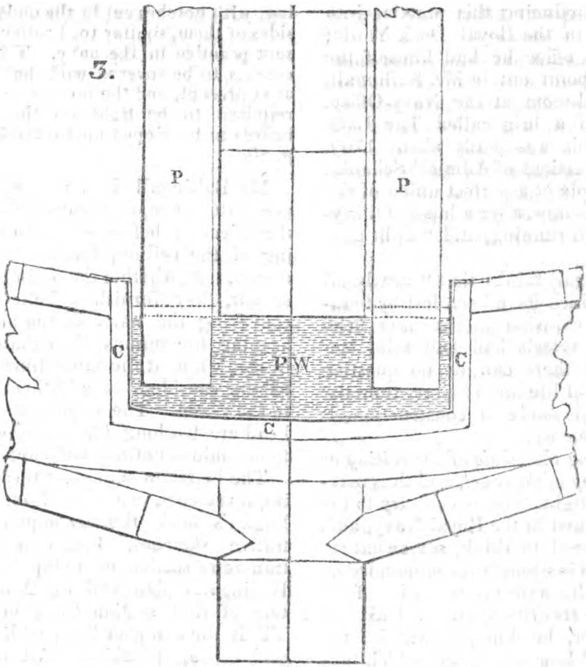
BALLINGALL'S IMPROVEMENTS IN SHIPBUILDING.

It is now upwards of twenty years since Sir Robert Seppings introduced into the Royal Navy various improvements in ship-building, which are universally allowed to have imparted great additional strength, safety, and durability to our ships of war: yet, to use the words of Mr. Knowles, (*Inquiry into the Means which have been taken to Preserve the British Navy*) such is "the jealousy incident to human nature, in properly appreciating and applying the inventions of others, or the indolence of the mind in not bringing itself to examine new methods or combinations,—these improvements, while they have been eagerly grasped by foreign nations, are but slowly introduced in the ships of our merchants, and, with an apathy hardly to be credited, are totally neglected by the first trading company in Europe (the East India Company)." The advantages of the improved system, however, are so manifest and indisputable, that all that was wanting to bring it into general use, in the mercantile navy, was, that some influential individual connected with shipping should take it up,—should make it his business to promote its adoption, not only by his own example, but by pressing it in every possible way on the public attention;—should do, in short, for the merchants' yards, what Sir Robert Seppings has done for the King's. We are happy to say that such an individual has at length been found in Mr. Ballingall, the author of a very clever and intelligent work, which we have now before us, entitled "The Mercantile Navy Improved."* Mr. Ballingall has brought to the task he has undertaken, not only all the weight of an official situation of considerable prominence, but great practical experience, combined with what seldom accompanies it in men of his class, a very earnest and clear-sighted desire of improvement. He candidly acknowledges that "the greater part" of the alterations in construction which he proposes to have adopted in merchant ships, are already "in practice in the Royal Navy;" but he has at the same time enhanced the utility of these alterations by so many new suggestions, and added so many valuable contrivances, entirely his own, that he has a fair claim to be considered as himself an improver of the first order.

We cannot undertake to give, within the limits to which we must needs confine ourselves, the whole details of Mr. Ballingall's system; but we shall endeavour to place in a distinct point of view before our readers, two or three of its more important features.

1. *The filling in of the timbers*; that is, bringing the ribs or frames into one compact body up to the gunwale, claims, on account of the immense consequences dependent upon it, the first place in our consideration. A ship is but an arch of peculiar adaptation, and the strength of every arch is in proportion to the mutual dependance of the parts on each other; but, according to the ordinary mode of building merchant-ships, not more than one half the timbers have such a mutual dependance. Every alternate couple of ribs only is connected together, and the intermediate timbers (absurdly enough termed *fillings*) are entirely unconnected with each other, resting only on the outer planking, without contributing, in the smallest degree, towards the support of the general structure. This loose and dangerous mode of construction has, at the instance of Sir Robert Seppings, been altogether abandoned in the construction of our ships of war. Every couple of ribs, without exception, is closely connected, and all the smaller interstices, as high as the floor heads, are filled in and caulked; in short, the bottom is converted into one compact solid mass, and that wholly exclusive of the outer planking. It must be evident that a ship thus constructed may sustain very considerable damage in her outer planking—lose actually a plank or two, or even her keel—and yet reach the place of her destination; while the loss of even a portion of a single plank or of the keel would be the destruction of a vessel built on the present mode. When water gets once past the outside planking of an ordinary vessel, nothing but the pumps can save it; and should these get choked, or the crew become exhausted in working them (both very common cases), down she must go. From numerous illustrative instances adduced by Mr. Ballingall, of the advantage which ships of war possess

* The Mercantile Navy Improved; or a Plan for the greater Safety of Lives and Property in Steam Vessels, Packets, Smacks, and Yachts, with Explanatory Drawings. By James Ballingall, Manager of the Kirkaldy and London Shipping Company, and Surveyor of Shipping for the Port of Kirkaldy, 1832. Morrison, London.



over merchant vessels in this respect, we quote the following:—

"On or about the same ledge of rocks on which the Wolf sloop of war struck, and lay fast for two nights and a day, in March, 1830, at the back of the Isle of Wight, the vessel at the time she struck going at a considerable rate through the water, at the very top of high water of a high spring tide, and with a considerable swell on, and which vessel was got off again and is now in the East Indies, having been dragged over the rocks for half a mile by assistance from Spithead, the vessel beating very hard upon the rocks with the lift of the sea all the time, the Carn Brea Castle, free trader to India, was lost only a few months before, having got ashore under more favourable circumstances for getting off again. What could this be owing to? The ships were nearly, I believe, of similar tonnage. The answer is plain and obvious. The Wolf had a solid bottom of 15 inches thick at the keel, being 12 inches of timbers, and 3 inches of outside plank, without allowing her to have had any ceiling. The Carn Brea Castle would only have an outside bottom plank to protect her, of I presume 3 inches thick. Yet this vessel would have] timbers of 12 inches thick, if no more, and a ceiling plank of, I also presume, 3 inches thick, making 3 inches more than the sloop of war, but neither of which were of the least use to her in keeping out the water. Had her timbers been close and her ceiling been caulked, she would have had one more protection than the sloop of war, viz. the ceiling plank, without taking any thing from her stowage, and the fair inference is that she would have been got off and preserved."—p. 97—99.

Mr. Knowles, in a letter to Mr. Ballingall, dated "Navy-Office, October 24, 1831," states that "the whole navy proves that the ships with solid bottoms have been more durable than they used to be when openings were left;" and he particularly specifies the case of the Success, which went ashore in Cockburn Sound, when "the whole keel was carried away, also the lower piece of stern, five feet four inches of the sternpost, four pieces of the dead wood, nine strakes of the bottom, amidships, and many strakes in the bows, and yet this ship was floated off."

Sir Robert Seppings has justly the

credit of introducing this practice into general use in the Royal Dock Yards; but when in office he had himself the liberality to point out to Mr. Ballingall, in the model-room at the Navy-Office, the model of a brig called The Lady Nelson, which was built about 1790, under the directions of Admiral Schanks, on the principle of a perfect union of the timbers, and is now, after a lapse of thirty-two years, still running, and "tight as a bottle."

Mr. Ballingall thinks that "nearly all the vessels which have been lost by foundering and collision might have been saved, if the vessels had had solid bottoms;" and there can be no question that the loss of life and property from the neglect of this mode of construction, is annually immense.

2. *Caulking the whole of the ceiling or inner planking of the vessel*, and thus making it water-tight. This is contrary to the practice pursued in the Royal Navy, and, we are induced to think, somewhat superfluous, but is strongly recommended by Mr. Ballingall, on the ground of its affording a double security against a leak. If this, however, be done, it will be naturally asked how any water, which may have got into the vessel from in-board, is to get to the pumps to be pumped out? The answer to this question brings us to Mr. B.'s third important improvement, which consists in

3. An improvement in the water-courses, by means of what are called percolators:—

"I would propose a water-course to be led alongside the kelson on each side, as far forward and aft as may be required from the spring of the vessel raised above the level of the adjoining ceiling, by what I would call percolators, and the bottom of said water-course sunk at least an inch and a half or more below the level of the adjoining ceiling, to allow any water which might get into the vessel to drain off the ceiling into this water-course. There should be a gradual acclivity forward and aft, to cause the water to flow readily along the water-courses to the bottom of the pumps. This would be greatly assisted by the spring of the vessel. In men of war, East and West India ships, and, in general, in all vessels which either carry no cargoes, or their cargoes in packages, these percolators may be readily made of strong and thick oak battens, fastened to the ceiling close to the water-courses, and raised, say from 6 or 8 inches high above the ceiling, with notches cut in the under edges or sides of them, similar to, I believe, the present practice in the navy. These water-courses to be covered with limber boards, as at present, and the boards would not be required to be tight on the top; the boards to be sloped up to the kelson."—p. 20.

Mr. Ballingall does not propose these percolators simply because they obviate the objection before stated to the caulking of the ceiling, but for this further reason, that, whether the ceiling is caulked or not, they furnish a better means of conveying the water to the pumps, and keeping the pumps clear than any now in use, while at the same time they contribute considerable additional stability to the vessel. The explanations on this head are too long for quotation, but are to our minds entirely satisfactory.

The better to elucidate these different improvements, we copy from Mr. Ballingall's book the accompanying illustrative sketches. Fig. 1 is part of a transverse section of a ship [built on Mr. Ballingall's plan, and fig. 2 a continuation of that section (part broken off). TT is the compact floor, with its bottom and ceiling planking. AA are guards fitted to protect the percolators from damage by shovels, &c. in taking out ballast or unloading a cargo. BB spaces filled with tanner's bark, charcoal, &c. or such substances as will allow the water to flow freely through them, and keep back sand, and so prevent the copper strainers, on the outer edge of the percolators from being choked. CC the copper strainers (shown by double lines) on the outer edge of the percolators. DD the percolators, the lid or covering being open on the starboard side in midships, and shut on the larboard side and at the bilge receiver. EE limbers or receivers for water. FF the pipe which leads from the water course down into the well prepared for it at the bilge. G shows the top of one of the main percolators opened; that on the other side is represented as shut. BP is the bilge piece; SS the water courses, serving as supporters to the bilge piece. Fig. 3 is another transverse section, showing the alterations necessary to be made in the positions of the pump (P), Pump well (PW), and cistern (CC), in order to suit the new system. Fig. 4 is part of a longitudinal section of a merchant vessel, cut off at a line perpen-

dicular to the outside of the keel. F is the floor, G the futtocks. It will be seen from this, that the outside planking is reduced at the garboard strake, A, to one half the general thickness, by the rebate for the water course; so that supposing the general thickness to be, as usual, 3 inches, only one inch and a half is left between the inside of the ship and the element on which she floats. Fig. 5 exhibits, in section, the same part of a vessel, as constructed on Mr. Ballingall's plan. Here the floors, futtocks (or cross pieces G), planks of the bottom (A), and ceiling plank (CP), form one complete mass and present a substance of 18½ inches, (instead of 1½ !) to withstand all accidents.

Among the subordinate advantages attending this improved system of ship-building, there are two which are particularly deserving of notice: one is the greater security from fire which it affords, in consequence of all the vacancies, which at present act as so many funnels to the flames, being filled up; and the other, the protection obtained from vermin, in consequence of there being no harbour left for them between the timbers and the inside and outside planks.

Various objections to the system will naturally suggest themselves to the minds of practical men; it is certain, also, that the improvements which it embraces are not equally applicable to all merchant-ships: but before any ship-builder or ship-owner rejects it on either account, we would earnestly advise him to send for Mr. Ballingall's book, where he will find nearly every possible objection very frankly discussed, and every modification which particular circumstances may call for, provided for with great intelligence and ability.

We perceive, from a letter which Mr. B. has published, from Messrs. Ogilvie and Crichton, of Leith, the builders of the Royal Adelaide steam-ship (one of those which ply between London and Edinburgh), that she has been built, "in most respects, on the plan now recommended," and that it is the intention of the Company to which it belongs to adhere to that plan "in any vessels which they may hereafter build." We trust that so judicious and spirited an example will not be long without numerous imitators.

Mr. B.'s book contains also instructions for rendering vessels, already built on the present plan, more secure at a cheap rate. He particularly recommends a revival of the plan of placing a doubling on ships, as was proposed as far back as 1792, by Mr. Snodgrass, surveyor of shipping to the East India Company. Mr. S.'s plan was, "that no ship should have a thorough repair; but instead of this, that its bottoms and upper works should be doubled with three-inch oak plank, from keel to gunwale, and strengthened with knees, standards, and even iron riders, if necessary, all which might be done at a small expense." Mr. S. thought that ships so repaired would "be stronger and safer, and be able to keep the seas longer in the worst weather, than new-ships," (that is, new ships on the old construction;) and in this opinion Mr. Ballingall perfectly concurs. The Company of which Mr. B. is Manager have had two of their smacks, the Enterprise and the Fifeshire, thus doubled; and it appears from the following paragraph, which we extract from the *Scotsman* of the 28th November last, that the result has been most satisfactory:—

"We understand that since the Kirkaldy and London Shipping Company's smacks, Enterprise and Fifeshire, have been fitted with double bottoms, they have frequently been deeply laden—have encountered very stormy and tempestuous weather—and were both at sea during the late very severe storm on the 10th curt., when so many vessels were wrecked, and have not admitted a drop of water through their bottoms or sides."

CURE OF CONSUMPTION.

Sir,—After an extensive inquiry, I find no class of people in this metropolis so exempt from pulmonary consumption as butchers, and others employed in the occupations incident to the sale, division, and various processes to which recently-killed animals are subjected. I am induced to send this brief statement for insertion in the Mechanics' Magazine in preference to drawing up such a report as the subject merits and the facts already ascertained might warrant, because in addressing myself to your numerous readers, I think that I am more likely to find among such of them as may be threatened with pulmonary consumption individuals with fewer prejudices to overcome, and who can give a trial to the plan of living in an atmosphere where the effluvia from recently-killed animals is

always present, with less inconvenience to themselves than victims to the same disease in the higher ranks of life, who could not, without exciting much remark, and subjecting themselves to serious inconveniences, adopt it.

An antiquated belief in the virtue of an atmosphere impregnated with the effluvia from healthy animals was, in all probability, a refinement on the deduction I have here stated, but by which the principles are wholly reversed. On this head more may be said if necessary.

To what extent of decomposition animal matter continues capable of acting beneficially on persons labouring under a tendency to phthisis, I am not so well prepared to say; but I believe, in the several processes to which animal matter becomes subjected, the same results will be found, so long as the principles of ammonia do not enter into this ultimate combination. In the manufactures to which the less easily destructible parts are subjected, I am able to speak with some confidence. The operation of tanning, and, as far as my inquiries have gone, I am disposed to believe all the manipulations connected with the preparation and keeping of leather, prove, in a great degree, preservative from the low and insidious inflammation which forms the early stage of phthisis. It is certain that in these trades there is a remarkable immunity from the complaint. In the early stage of the disease, and where a strong hereditary tendency exists, I am now persuaded that a residence in such an atmosphere as I have described would (with other aids) be highly preferable to removal to a warmer climate. In conclusion I have to say that, if from this notice any person is disposed to give the plan a trial, he or she may, after a perseverance of one fortnight, apply *gratuitously* for any advice I can give on the subject.

I am, &c.

JOHN VETCH,
Physician to the Charterhouse.

TO THE BOARD OF TRADE.

The proposed Decimal Division of the Coin.

The Society for the Diffusion of Useful Knowledge have this day (26th Jan.) proposed that the entire national expenditure shall be augmented at least £4 3*s.* 4*d.* per cent.!* The words of the proposition are, that the sovereign shall be

The unit	=	250 pence	=	1,000 farthings.
The shilling	=	12½ ..	=	50 ..
The penny	=	1 ..	=	4 ..

During the administration of the Duke of Wellington and Sir Robert Peel every shilling which was coined bore the stamp "*one;*" thereby declaring the fact, that the shilling is the monetary unit, and that silver is the standard of value.

The silk-weavers have proved, beyond any cavil or disputation, that the difference between the prices of Lyons and Spitalfields is 41 per cent.! Mr. Barrett Wadden has submitted to Parliament a detailed statement of the English prices, which *exactly* correspond with the French course of exchange. The American dollar, payable in London, is valued at Paris for 51 pence. Thus, 4½ shillings : 6 New England shillings :: 100 : = 41 per cent. Dr. Bowring's calculations are erroneous.

The par of exchange between France and the United States is established upon the commercial law which is laid down in the English charter—there shall be but one weight; which distinctly recognises the principle of political economy upon which the Americans and French carry on trade, namely, that gold and silver are, as silk and every other denomination of merchandise which is sold by weight, merely articles of merchandise. We find that the French pound weight of silk is heavier than the English pound weight of silk, as the par of exchange; in silver at 90 fineness.

* The proposition to which our ingenious correspondent alludes is contained in the *Penny Magazine* of the 26th of January last, into which it has been copied, without acknowledgment (as usual), from a communication to our own work by Mr. John Jackson, dated the 15th of October, and published the 8th of December last. It is but fair, however, to the Useful Knowledge Society, as well as to Mr. Jackson, to subjoin a remark with which this republication of the scheme has been accompanied:—"We are not advocates of any such change, but rather the contrary; but we are convinced, that if any alteration ever take place, *this should be the one.*"—ED. M. M.

5 francs 43 centimes = 6 New England shillings.

The franc, the monetary unit of France, is the *hundredth* part of the French pound weight for every description of merchandise.* The New England shilling, which is the Canadian *livre*, is exactly the hundredth part of the English pound weight of 16 North, and also South American ounces. Therefore, as Dr. Bowring states, there were imported into the United States from France, in 1830, silks to the

	Dollars.
Amount of	3,548,378
While from England, in the same year, only to the amount of	369,561

because England, being the only country whose monetary standard is gold, the weight of the dollar must be imaginarily depreciated from 420 grains, which is the *maximum* weight, to ($87 \cdot 27 \times 4\frac{1}{4}$ shillings) 370 grains of silver!!! That Mr. Pitkin, of New England, who is allowed by the French Government to be the first commercial writer of this age, cannot understand why a Boston merchant should exchange 420 grains of silver for 370 grains of silver; that the Governor of the Bank of England should declare to Parliament, that "it is wholly impossible to define the par of exchange in figures;" that Mr. Rothschild should declare to Parliament, "there is no par of exchange," consequently no measure for either the capital or labour of this the most extensive empire which has ever existed; that the pound weight of gold shall be sold in England for 14·159 pounds weight of silver, though in South America since 1772, and in North America from the 14th of July last, the countries from which those metals are directly imported into England, the lowest price of the pound weight of gold has been 16 pounds weight of silver;—can be accounted for only by the superior genius of Lord Bexley and Mr. Herries, who, having "put their heads together," produced the same amount of wages and profits

From the expression $\dfrac{934 \cdot 5}{66}$

As from the expression $\dfrac{934 \cdot 5}{62}$

by which, for upwards of two hundred years previous to 1819, was demonstrated the Mint proportions of gold and silver! So much for "the science of adding to subtract."

We read in the reports of the speeches delivered in Parliament by the Marquis of Lansdowne, the Lord President, on the 25th of February, 1830, and by the Vice-President of the Board of Trade, Mr. Thompson, on the 8th of June, 1830, those principles of commercial science upon which the Americans and French are mutually acting. The Americans, who have already 92,000 seamen employed in their commercial marine, determine "the balance of trade" upon the principle laid down by Mr. Pitkin; which is *not* by the plus of exports, but *per contra*, by the larger amount of imports, or returns, or profits. The French Government have adopted this principle.

The people of the United States exchange the dollar for 400 quarter-cents. The people of the British empire are entitled to 100 cents $\times$ 4 = 400 quarter-cents for the shilling. I believe this is a very fair translation of "*de faire des* $\times$." Lord Brougham, who, doubtless, is not aware by what principle of *equity* the home trade has been *balanced** in the scale of justice at 437½ grains against the foreign trade at 480 grains, will, in this case, allow the balance to preponderate in favour of millions of labourers, who have been very *lightly* treated.

The people of England, Scotland, and Ireland—of French and English Canada—of French and English Nova Scotia—and of the British West Indies—have from infancy been accustomed to make their monetary calculations in shillings and pence. There are 100 farthings to the East India rupee of account. There are 10 pence to the Canadian *livre*, which cannot be integrally expressed in cents. of the United States. The English, Irish, Canadians, and the British West Indians, have imaginary pounds sterling of different values.

A most important trade might be carried on with the colonies, more especially

* There are to the kilo 200 francs $\times$ 5 = 1,000 grammes.

* Not by Mr. Pitkin's "Balance of Trade."

with the East Indies (whose labourers are paid in sea-shells), by the exportation of copper money.

Having for many years considered the consolidation of the accountability of the empire a most important question, I beg leave to address this paper to the Board of Trade.

T.

Jan. 26, 1833.

WARMING APARTMENTS AND COOKING BY GAS.

Sir,—Some experiments in which I have been recently engaged, convince me that coal gas, if properly applied, might be economically employed as a substitute for domestic fires, not only in warming our dwellings from the scullery to the attic, but also in conducting every process belonging to the culinary department. It will be especially applicable, I conceive, to small families during the summer season, by whom, under skilful management, it might be used with a great saving of time and labour, and a still greater saving of expense.

The comparatively small quantity of gas that is required to cause two or three quarts of water to boil, even in a common saucepan, or tea-kettle, and the smaller quantity that is necessary to keep it boiling for several successive hours, will, I think, prove to any one who will make the trial, that the plan is practicable. If culinary vessels were constructed, and expressly adapted to suitable apparatus, on the principle of economising heat, the cost of gas for carrying on the various operations required in a family, would be a mere trifle, as compared with the expense of a coal or wood fire, where two-thirds, or at least one-half, the heat evolved by the combustion of the fuel escapes unemployed at the chimney.

I should be glad to know if there has been any simple and effective apparatus yet contrived for boiling and roasting by gas?* To be really useful, it must be cheap.

Those who live in towns remote from the metropolis have but few opportunities of becoming acquainted with the numerous applications of science to the useful arts. This consideration must be my apology, Sir, for occasionally asking questions, and offering hints, which to some of your readers may perhaps appear trifling. I am not influenced by a desire for personal gratification alone. There is a numerous, a respectable, and a justly influential class of persons, who read the Mechanics' Magazine, but who have not time, nor means, nor opportunity, for consulting larger and more expensive works. To such persons, that knowledge is really "useful" that applies to the every day purposes and pursuits of life. Abstract science is only understood and appreciated by the comparative few, although it might be exhibited in a cheap form, and recommended by deservedly great men.

J. O. N. RUTTER.

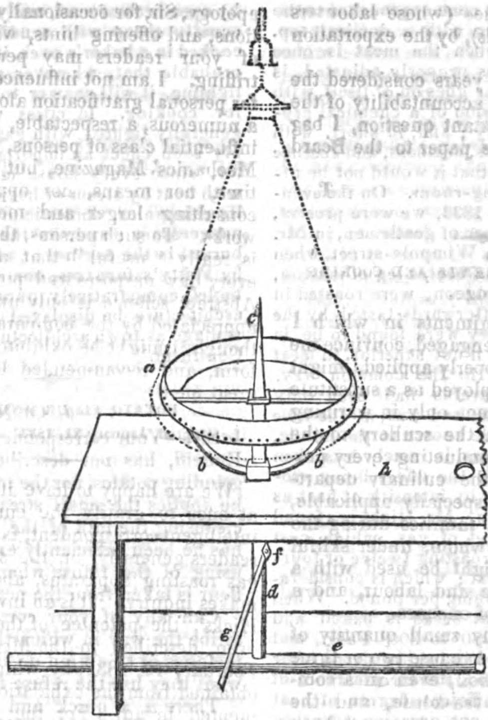
Lymington, January 21, 1833.

* I have heard, or read, lately of a 'patent gas roaster,' but whether for roasting coffee, or a couple of fowls, I have no means of judging.

We are happy to have it in our power at once to gratify the curiosity of our intelligent correspondent, as well as of our readers generally, on the subject of the gas roasting apparatus, about which he makes inquiry. It is an invention of Mr. Hicks', the patentee of the new baking oven, described in the Mech. Mag., for February 12, 1831, by which alcohol is obtained from the exhalations of the fermented bread. For the following description of Mr. H.'s gas roasting apparatus, and the illustrative engraving, we are indebted to Part IX. of Mr. Loudon's "Encyclopædia of Cottage and Villa Architecture," published on the first of the present month, and which, like all the preceding parts of this very comprehensive work, is not more distinguished for the usefulness than the novelty of its contents.

HICKS's GAS ROASTING APPARATUS.

"The gas is admitted to a metallic circle, fig., *a*, through a very narrow continuous opening, round the outside of which the gas issues, and forms a ring of blue flame. In the centre, supported by two lateral gas tubes joined to the circle, is an upright spike, *c*, serving as a spit on which the meat to be roasted is stuck. From the centre of the circle the pipe, *d*, which supplies the gas, passes down to the gas main, *e*; having a cock, *f*, with a regulating lever, *g*, by which the gas can be turned on or off, and the degree of flame produced can be regulated with the greatest nicety. The circle is raised a few inches above a bench or table, *h*, so as



to admit of the introduction of a convex tin dish, furnished with a spout for receiving the dripping, under each spit. From this dish the dripping runs off by the spout, and is collected in any common dish placed under it. Over the bench, at the height of three or four feet, is a projecting boarded canopy or hood, for receiving the heated air and smell from the gas and meat, and conducting them to a flue, so as to prevent them from accumulating in the kitchen. Directly above the gas circle is a cone of polished copper, suspended by a weight. This cone is two inches wider in diameter at the base than the gas circle, and it has a small orifice at the top. When the operation of roasting is to be performed, all that is necessary is to spit the meat, and light the gas, regulating it so as to produce only a blue flame, closely resembling a blue riband round the base of a black turban; and then to bring down the copper cone until its lower edge is on a level with the base of the gas circle. A vessel to receive the dripping is then placed under the spout of the tin dripping-dish, and the process of roasting goes on, without basting or any other operation whatever being requisite. The heat produced by the gas is radiated from the copper cone on the meat, and, this being done equally on all sides, the latter never requires turning, while, the heat not being so intense as that from an open fire, the meat is neither dried nor burned, and, consequently, does not need basting. It is, in fact, roasted by heated air, but air which is constantly renewed; and, therefore, this operation has no affinity with baking. The time required for roasting in this manner is shorter than that before an open fire, in the proportion of about twelve to fifteen; it requiring fifteen minutes for roasting every pound of meat before an open fire, and only twelve minutes for roasting the same quantity by gas. As the cones are nicely balanced, in the manner of chandeliers suspended from lofty ceilings, the cook, when she wishes to look at the meat, can raise and lower the cone hanging over it, with the greatest ease. The fat drops slowly, and as pure as water, into the dish placed to receive it; and when the period of dressing is nearly completed, it is indicated by the appearance of gravy being mixed with the fat. For different joints, and for fowls of different kinds, and game, there are rims and covers of different sizes; and for a

sirloin of beef, the cone approaches to the form of a cylinder with a domical top. The operation, when the meat is once spitted, and the gas properly adjusted, is conducted or rather goes on of itself, with all the quiet precision of a chemical process in a laboratory; and, in short, with so much cleanliness, neatness, and absence of smell and heat, that it would not be offensive in a drawing-room. On the evening of January 5, 1833, we were present, along with a number of gentlemen, in Mr. Hicks's kitchen, in Wimpole-street, when a part of a sirloin of beef, a leg of mutton, two fowls, and a pigeon, were roasted in this manner, and afterwards tasted by the company, when they were found to be in all respects equal, if not superior, to meat and fowls roasted in the common way. Mr. Hicks's apparatus had been only erected a few weeks, and was, at the time we saw it, not made known to the public. The expense of gas is much less than might be imagined, the effect being produced not so much by intensity of heat as by its concentration. Mr. Hicks has found sixteen cubical feet of gas, which cost 2¾*d.*, sufficient for roasting twelve or fourteen pounds of meat; which is considerably less than a farthing per pound. When it is considered that bread is baked and browned at from 280° to 300° Fahr., and that meat is roasted in bakers' ovens after the bread is removed, the circumstance of gas affording a sufficient degree of heat for roasting will not occasion surprise. We have before described the mode by which boiling and stewing by gas has been for some time practised in Edinburgh;* and it is clear that, as roasting can be also effected by it, so may baking. The whole business, therefore, of the preparation of human food by the application of heat, may be performed by gas, and that with great economy, in all families who roast and bake at home. This is only realising what was long ago anticipated by the late William Strutt, Esq. of Derby. There can be no doubt that oil, or any liquid fat burned in the same manner, would effect the same end; and, indeed, this is proved by the portable machine for the use of ships and ambulatory cottages, invented by Mr. Cochrane, and sold by Josse, in Regent-street. How far the art of cooking by gas will be suitable for country inns, may be considered uncertain in the present infancy of the invention; but as, on calculation, it is found in London to be much cheaper than roasting by open fires of coal, and, for small joints, equally cheap with sending meat to be cooked in a baker's oven, it appears highly probable that, wherever gas is used for lighting, it will answer to employ it also for cooking. In cities which are now generally lighted with gas it will probably soon effect an important revolution; for, since every house may be supplied with heat by steam or hot water from public companies, domestic fires will become unnecessary; and, as the smoke may be burned in the engines of all manufactories by Witty's furnaces, our atmosphere may be left comparatively pure, and our town architecture be displayed to as great advantage as town architecture now is on the Continent."

* The account here referred to is contained in a letter to Mr. Loudon, from a correspondent at Edinburgh. A fuller account, with an engraving, from the inventor himself, will be found in the Mech. Mag. of July, 1831.—Ed. M. M.

POTATO FLOUR AND BREAD.

Sir,—Your correspondent, G. L. S., of Enfield, has not described his mill for grinding potatos, nor the method in which he applies the small stream of water for cleansing the mill of the pulp. Neither has he been sufficiently explicit as to the using of the refuse when the farina or flour is taken from the potato.

Can any of your correspondents describe the way in which the lage manufactories of this kind do their work, and what they use the refuse for?

There is a quick and ready sale for potato flour, both at Manchester and Glasgow, for the use of the calico-dressers; that article having long superseded every other material for that purpose, with the best calenderers.

Whether for food, or for the arts, it is a matter of the most serious importance that this manufacture should become general.

If Mr. G. L. S., will give us all the information he is in possession of, as to the *modus operandi*, and will also mention the number of tons he grows per acre, the quantity of farina yielded per cwt., and how many pigs he feeds *per acre* on the refuse, the public will better appreciate his services than it seems they have been estimated by the sluggish Board of Agriculture.

I am quite aware that, through the medium of the Mechanics' Magazine, this simple art will obtain such a discussion, as to its mechanical wants, as will ensure "*a right good and unexpensive means of triturating the potato into pulp,*" and I am sure, Mr. Editor, the knowledge of its application to the advancement of

agriculture will not be stopped by you, in its passage to the public from your correspondents.

I am, &c., &c.,
AN AGRICULTURIST.

Sir,—Seeing some remarks upon potato flour in your work, I send you the following:—

The farina of potatoes will not answer instead of wheaten flour, as it is nothing but pure starch, whereas the principal ingredient of common flour is gluten, of which wheat contains a larger proportion than any other grain. In the twenty-third number of the *Repertory of Arts* there is an account of a method of granulating potatos, by first steaming and afterwards peeling them; then placing them in a tin cylinder, pierced full of small holes, into which a piston is fitted, when, by pressing down the piston, you force the pulp of the potatos through the holes in the side; the pulp, as it comes out, takes the form of vermicelli, but afterwards, by its own weight, separates into small pieces, the size of grains of rice, which when dried are similar to rice, and of an agreeable smell and transparent appearance. The pulp thus prepared is to be ground to flour, which, by being mixed with common wheaten flour in equal proportions, makes excellent bread, being very light and capable of being kept a long time. It may be also used as common rice, either whole, or ground to a coarse powder in a coffee mill.

I am, yours truly,
CHEMICUS.

The subject of manufacturing flour from potatos, and that flour into bread, happens at the present moment to be one very much discussed among our French neighbours; and it would seem, from the notices which we subjoin, that they have made more progress towards the desired result, than we can yet boast of in this country. The large prize which the Society for the Encouragement of National Industry has offered, will in all probability elicit all the additional information and skill which the case stands in need of.

Royal Society of Agriculture, January, 1832.—M. Dailly presented a specimen of bread, *made entirely from potatoes*, by means of a particular process, invented by M. Lefevre. It had been baked fifteen days, was still fresh, and seemed very well raised; it is light, of a tolerably white colour, and of a taste which, though not to be compared with that of wheaten bread, is far from being disagreeable. M. Hachette stated that the inventor is a manufacturer of potato flour, and that he has discovered the means of converting it into a consistent and ductile paste, susceptible of taking the form of vermicelli; of which paste he believed the bread in question to be made, after fermentation has been produced by a leaven.

Ibid., February, 1832.—M. Quest presented a specimen of bread, made of potatos in the following manner:—The potatos being washed and bruised by means of a rasp or a mill, the pulp is dried and reduced to flour, in which state M. Quest calls it *parmentine*. To convert this into bread, he adds the ordinary proportion of yeast, and then mixes the whole up with a sufficient quantity of water to form it into a paste, which is not long in fermenting when subjected to a proper temperature. The baking is afterwards performed in the ordinary manner. The bread is of a brown colour, and not of a disagreeable taste. M. Quest showed that the bread might be sold at Paris at ten cents. per pound, and he thought that in farm-houses in the country the cost would be much less. The Society appointed a Committee to investigate and report.

Society for the Encouragement of National Industry, December 1831.—The Society has agreed to offer a prize of 6,000 francs, for the discovery of a means of manufacturing a bread from potato flour, that will rise like that made from wheaten flour. To be awarded in 1834.

RECENT AMERICAN PATENTS,

With Remarks and Exemplifications by DR. JONES, *Superintendent of the Patent Office at Washington.*

(Selected and abridged from the *Franklin Journal*.*)

WOOL SPINNING. *William Calvert and Alfred Messenger*.—The patentees

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* The generality of the inventions patented in America are, according to the testimony of Dr. Jones—a very competent judge—of even less "mark and livelihood" than those patented in this country—which, it must be confessed, is saying a great deal. "The word *improvement*," as Dr. Jones sarcastically, but well, observes, "when applied to patents, is not by any means to be taken in its ordinary acceptation, as in numerous instances it means

state that this machine resembles those in general use for spinning worsted and cotton; but that, from placing the rollers nearer together than in worsted machinery, and making them larger than in that for cotton, it produces yarn which could not be obtained from either of them. The wool is taken from the carding condenser on to a feeding cylinder, whence it passes through all the rollers, of which there are three pairs; two being small, and placed between the ordinary drawing rollers. The feeding cylinder, it is said, has never before been applied to the throstle frame. The difference in the mode of spinning, from that in other machines, is that it is effected by a continuous motion; the thread being wound on the bobbins, or spools, as fast as the roping is discharged from the rollers, the rollers not stopping, as in the common machines, whilst the roping is drawn and twisted. It is averred that three times the ordinary quantity may be spun by one of these machines,—six spindles producing as much as eighteen have heretofore done. The quality of the yarn is said to be much improved, the fibres being drawn nearly straight, as in worsted.

Protecting Bank Notes. *Francis Peabody and Joseph Dixon.*—The object had in view by the patentees is to prevent the counterfeiting of bank notes by means of lithography. Those acquainted with that art are aware that the impression upon a bank note, or other engraving, printed with ink into which oil enters as a component part, may be transferred on to stone, and the stone then used to furnish similar impressions on paper. In Europe the utmost perfection has been attained in this process, which, as it is merely mechanical, may enable one who is no artist to imitate the work of the best engravers in a way which shall defy detection. The means by which the patentees effect their object is by taking printers' ink, or ink made from oil, which is to be of a pink, light blue, or other tint, and which will serve as a ground for the black ink generally used in printing bank notes. The paper intended to be printed on is first covered wholly, or in part, with the light-coloured oleaginous ink, and after this the notes are printed with black ink in the usual way. Any attempt to make a lithographic transfer from paper so prepared must fail altogether, as every part which has either the tinted or the black ink on it, will affect the stone, and only a confused, blurred impression, can be obtained from it.

Turning Whip Sticks. *Andrew Mallory.*—The stick to be turned is to be fixed in the mandril of a common turning lathe, and the apparatus here patented placed in front of it. It consists, in part, of a frame with parallel sides, equal in length to the length of the stick to be turned. A piece carrying a cutter, which operates as a gouge and chisel, slides along in grooves on these sides. This sliding part consists of two bars hinged together at one end, and capable of being opened or closed at the other; and near to this latter end is fixed the cutter before spoken of. The stick to be turned rests on a hollow bearing of metal on the lower piece, and the cutter passes through the upper piece. It is evident that if these two parts, which form the hinged sliding bar, recede from each other as the bar advances, the article operated upon by the cutter will have a corresponding increase in its diameter. To effect this, each of the bars has a tongue on it, which slides in a groove on one of the cheeks of the frame. There are, of course, two grooves, and if these were parallel to each other the two parts of the sliding bar would keep at the same distance apart, and the article turned would be cylindrical; but if the grooves recede, the bars will be gradually separated, and the article will be tapered.

Cotton Press. *David Philips.*—There is more novelty than usual in the construction of this press. The packing is effected by means of a screw, which is placed vertically, operating upon followers in a box placed horizontally, and the machine may be so constructed as to pack two bales at once. Two strong beams, thirty-four feet in length, and two feet in width, are to be laid horizontally; these are connected together by end pieces framed into them, which end pieces

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any thing rather than the rendering of a machine better than it was previously. In a Patent Dictionary the definition which would most generally apply would be *alteration*, as this would include both the mending and the marring of any such article as may be altered." Such being the case as regards American patents (though only in a greater degree than English), it would be a mere waste of space to give the particulars of the whole of them, as some of our correspondents have urged; but we shall continue, as heretofore, to make selections of such as seem most distinguished for originality and importance.—Ed. M. M.

are equal in length to that of the bale to be formed. This frame, when enclosed below and above with proper doors, forms the boxes into which the cotton is to be forced by the followers. From the middle of this frame rise two vertical cheeks, between which the screw is sustained; this screw may be twelve or fourteen feet in length, and extends down below the horizontal box, where the power is applied to turn it. The nut through which it passes, slides between the cheeks, and is raised and lowered by turning the screw, which does not itself ascend or descend, but merely moves the nut. Now we will suppose the nut raised between the cheeks to the upper part of the screw, and the followers to be withdrawn from the horizontal boxes in which the cotton is to be packed; in this state of things the doors are to be opened, the boxes filled with cotton, and the doors then closed, when the operation of pressing commences. In order to cause the nut, as it is drawn down, to act upon the follower, strong pieces of timber are hinged to it by one end, and by the other to the followers; and when the nut is up, these timbers may stand at an angle of forty-five degrees with the frame; as they are drawn down they approach towards a horizontal position, and when completely down are actually horizontal. The two acting together operate like the toggle joint which is straightened by the screw, thus forcing in the followers upon the cotton. The usual provision is, of course, made in the boxes to receive the bagging and ropes for baling the cotton, which needs no explanation, as it is common to cotton presses of every description.

BLEACHING YELLOW BEES'-WAX.—Four vats are to be placed side by side, to facilitate their use. Into No. 1, 200 lbs. oxymuriate (chloride) of lime and 125 gallons of water are to be put; the mixture is to be well stirred, and the impurities allowed to settle. Into No. 2, 500 lbs. of yellow wax are to be put, and heat applied, either by steam or otherwise, sufficient to melt the wax, which is allowed to remain at rest, that its impurities may settle. The clear melted wax, and portions of the solution of oxymuriate of lime, are to be laded into vat No. 3, heat being applied to keep the wax melted, which, however, is not to exceed 160°. The mixture is to be constantly stirred for about an hour, in which time this first operation will be completed. A mixture, consisting of twenty pounds of sulphuric acid, diluted with thirty of water, is then added, and agitation kept up for half an hour. The acid, combining with the lime, sinks it to the bottom, and leaves the bleached wax floating above it; this settling is effected in about half an hour. The process has sometimes to be repeated a second or third time, depending upon the portion of colouring-matter in the wax. When the wax has been thus sufficiently bleached, it is put into vat No. 4, and as it still contains some water, this is to be separated from it. To effect this, thirty pounds of common salt are added, which, being soluble in, unites with, the water, and the weight of this solution causes it to separate from, and descend below, the wax, which thus acquires a clear and transparent appearance. To improve the white appearance of the wax, an ounce of pulverised Antwerp blue, previously mixed with a quart of the melted wax, is poured into vat No. 4, when the whole is deposited in proper vessels.

PREMIUMS OFFERED BY THE SOCIETY OF ARTS IN THE CLASSES OF CHEMISTRY, MINERALOGY, AND MANUFACTURES, FOR THE YEARS 1833 AND 1834.

Generation of Steam.

1. For the best method of generating steam for engines, in such a manner that its quantity or force shall be materially increased beyond the quantity or force of steam obtained by methods at present in practice, without increase of danger or expense:—*the Gold Medal.*

A full account of the process employed will be required, together with certificates of its having been successfully carried into effect.

Prevention of Smoke.

2. For an effectual method, superior to any in use, and verified by practice, of effectually preventing the emission of dense smoke from the chimneys of furnaces and fire-places:—*the Gold Medal, or One Hundred Pounds.*

Certificates to be produced to the Society, that the means proposed have been found to succeed in practice.

3. For the best account of the methods at present in use for effecting the consumption or condensation of smoke; with their respective advantages and disadvantages, and an investigation of the

causes which have prevented them from being more generally introduced into common use in furnaces and manufactories, and especially brewhouses:—*the Gold Isis Medal.*

Preventing Noxious Vapours in Manufactories.

4. For an effectual method, superior to any in use, and verified by actual trial, of preventing the ill effects arising from noxious fumes disengaged in chemical and other manufacturing processes:—*the Gold Isis Medal, or Thirty Pounds.*

Conditions the same as for No. 1.

Preventing the Ill Effects of Smelting Ores.

5. For the most effectual method of preventing the ill effects arising to vegetation and to animal life from the sulphureous, arsenical, or other noxious fumes disengaged in smelting the ores of copper, zinc, lead, tin, iron, &c. in the large way; and, if possible, of converting those pernicious fumes to useful purposes, in a manner superior to any hitherto known, or in use:—*the Gold Medal, or Fifty Pounds.*

Conditions the same as for No. 1.

Fine Bar Iron.

6. To the person who shall make the greatest quantity of bar iron, not less than 10 tons, with any fuel except charcoal, equal in quality to the best iron imported from Sweden or Russia, and as fit for being converted into steel:—*the Gold Medal.*

Samples of the iron, and of the steel made from it, to be produced to the Society; the quantity of the former to be not less than ¼ cwt., and that of the latter not less than 7 lbs., with certificates that the whole quantity is of equal quality.

Refining Copper from the Ore.

7. For a method of separating, purifying, and refining copper from the ore, so as to render it fit for those purposes to which fine Swedish copper is now applied, and capable of being brought into the market at the same price:—*the Gold Medal.*

Certificates that not less than three tons have been so prepared and refined, and a quantity not less than 14 lbs. of the copper so refined, to be produced to the Society.

Refining Zinc from the Ore.

8. For refining zinc from the ore, by a process superior to any hitherto known or in use, and rendering it fit for the purpose of making fine brass:—*the Gold Isis Medal, or Thirty Pounds.*

Conditions the same as in the preceding.

Preparing Brass.

9. For a method of making brass from materials the produce of Great Britain or Ireland, of superior quality to that commonly manufactured in this country:—*the Gold Isis Medal, or Thirty Pounds.*

A full account of the process, and of the ingredients employed, together with their proportions, and certificates that one ton has been so manufactured, and a sample of the brass, not less than 14 lbs., to be produced to the Society.

Pure Nickel.

10. For the best method of purifying nickel, and rendering it equal to that imported from Germany, at a price which will enable it to compete with this latter in the English market:—*the Gold Isis Medal, or Thirty Pounds.*

A full account of the process, and three pounds of the nickel, to be produced to the Society.

Improving Melting-pots.

11. For manufacturing melting-pots, for founders in brass, iron, or other metals, superior to those now in use, and not too expensive:—*the Gold Isis Medal, or Thirty Pounds.*

A full account of the process, with specimens of the pots, to be produced to the Society.

Crown Glass.

12. To the person who shall make crown glass equally transparent, and as free from blue and green colour as the best German sheet, and not more expensive:—*the Gold Isis Medal.*

Certificates to be produced to the Society tha not less than two cwt. have been made, together with one whole plate and two of the largest squares that can be cut, and a full account of the proportions of the ingredients, and of the process of manufacture.

Flint Glass.

13. To the person who shall invent a process for making flint glass free from veins, as dense and transparent as the best now in use, and quite fit for the purposes of opticians:—*the Gold Medal.*

A full account of the process, with certificates that it has been found to answer on repeated trials; that not less than 20 lbs. have been made; and that object-glasses, at least 3½ inches in diameter, have been manufactured of the same, together with specimens of the glass in its rough and manufactured state, to be produced to the Society.

Indelible Ink.

14. For a method of making a black writing ink, superior to any at present known, and indestructible by chemical applications, and that shall flow freely

from the pen:—*the Gold Isis Medal*, or *Thirty Pounds.*

Certificates that not less than two gallons of such ink have been actually prepared, with a full detail of the process of making it, and two quarts of the ink, to be produced to the Society.

Copperplate Printers' Ink.

15. For the best composition for printers' ink, superior to any hitherto known, and fit for the finest kind of copperplate printing:—*the Gold Isis Medal, or Thirty Pounds.*

Certificates that 112 lbs. of such ink have been made, with a full account of the process employed, and 6 lbs. of the ink, to be produced to the Society.

Preserving Provisions from becoming rancid or rusty.

16. For the best, cheapest, and most efficacious method, superior to any hitherto known, of preserving dry salted provisions from becoming rancid or rusty: —*the Gold Isis Medal, or Thirty Pounds.*

A full description of the method, with proper certificates that it has been found, on repeated trials, to answer the purpose intended, to be produced to the Society.

17. For a method of curing or preserving meat during long sea voyages, superior to any now in use:—*the Gold Isis Medal, or Thirty Pounds.*

Conditions the same as for the preceding premium.

Preventing the Dry Rot in Timber.

18. For a method of preventing the decay in timber called dry rot, superior to any hitherto known:—*the Gold Medal, or Fifty Pounds.*

The particulars of the method of prevention, confirmed by repeated experiments on a large scale, to be produced to the Society.

Dry Rot.

19. For the best account of the derangement in the organic structure of timber, at the commencement and during the progress of the decay which has hitherto been called dry rot, to be illustrated by microscopic and other drawings:—*the Gold Isis Medal.*

Preventing Mildew in Paper or Canvass.

20. For a process to be used in the manufacture of paper or canvass, or some application to be made to manufactured paper or canvass, which shall effectually prevent it from becoming mildewed:—*the Gold Medal.*

A full account of the process employed, with certificates and other evidence of its efficacy, to be communicated to the Society.

Preventing the Destructive Effects from Moths.

21. For a cheap, easy, and effectual method, verified by repeated and satisfactory trials, of preventing the destructive effects occasioned by moths and other insects, in furs, woollens, specimens of natural history, and other articles, superior to any hitherto known or practised: —*the Gold Medal, or Fifty Pounds.*

The accounts, with proper certificates, to be produced to the Society.

Moths.

22. For the best account of the various species of moths and other insects, which, in the British Islands, are destructive to silks, woollens, furs, and objects of natural history, illustrated by drawings of the animals in their various states:—*the Gold Isis Medal.*

Improved Black Dye for Silk or Wool.

23. For a black dye for silk or wool, superior in colour and durability to any at present in use:—*the Gold Isis Medal, or Thirty Pounds.*

A full account of the process, attested by satisfactory certificates, as well as samples of the silk or wool so dyed, to be produced to the Society.

Red Pigment.

24. For a red pigment, fit for use in oil and water, equal in tone and brilliancy to the best carmines and lakes now known or in use, perfectly durable, and more economical:—*the Gold Isis Medal, or Thirty Pounds.*

Four ounces of such colour, and a full disclosure of its preparation, to be produced to the Society.

N.B.—It is required that the colour should remain unaltered by common exposure to strong daylight, damps, and noxious vapours.

For an account of a red lake obtained from the *Galium tinctorium.* See Society's Transactions, vol. 46, p. 138.

Blue Pigment.

25. For a blue pigment, equal in colour, brilliancy, and durability to the best natural ultramarine, and which may be afforded at a cheaper rate:—*the Gold Isis Medal, or Thirty Pounds.*

The conditions are the same as in the preceding premium for the red pigment.

26. For an accurate account of the methods employed by the chemists of Germany and France in the production of the new blue pigment used as a substitute for ultramarine:—*the Gold Isis Medal.*

Conditions as for No. 24.

Lithographic Stone.

27. For the discovery in the United Kingdom, or in any British colony, of a bed of stone equal to the best German

stone, for the purposes of lithography: —*the Gold Isis Medal.*

A specimen of the stone, at least two feet square and two inches in thickness, with an account of the situation of the quarry, and certificates of its possessing considerable extent, to be produced to the Society.

Patterns for Damask.

28. For the best pattern of silk damask curtains:—*the Gold Medal.* For the next in merit, *the Silver Medal.*

It is required that the drawings sent in for this premium should be working drawings, and they must be sent in either before they have been worked from, or within six months after.

Patterns for Paper-hangings.

29. For the best design of a pattern of paper for hangings; the drawing to be in colours, and care to be taken that the pattern be so arranged that when the strips are applied to an extended surface, no unpleasant arrangement of lines shall be produced by partial or defective covering of the pattern:—*the Gold Isis Medal.* For the next in merit, *the Silver Medal.*

N.B.—For useful communications on any of the applications of Chemistry to the Arts and Manufactures, the Society will give Gold or Silver Medals, or Pecuniary Rewards, according to circumstances.

***All Claims for Premiums must be sent in on or before the third Thursday in January,* 1833.**

MISCELLANEOUS.

Liverpool and Manchester Railway.—Last half-yearly account.—It appears from the account of the Company for the half year ending the 31st December last, that notwithstanding a diminution of nearly 74,000 in the number of passengers during July and August (supposed to have been caused by the cholera), the loss on this account had, in a considerable degree, been made up by the greater quantity of merchandise conveyed, and a reduction in the general expenses of management. The total number of passengers during the half year was 182,823—the receipts £43,420. The merchandise conveyed amounted to 86,642 tons—receipts £37,781. The expenses, including £12,646 for repairs of engines, amounted to £48,278. leaving a clear profit of £37,781, which enables the Company to make a dividend, for the half year, of four guineas per share.

Mr. Gurney and the Liverpool and Manchester Railway.—The Directors of the Liverpool and Manchester Railway, in an " Answer" which they have sent forth to the article on " Inland Transport" in a late Number of the *Edinburgh Review*, (which, it seems, we were right in ascribing to Dr. Lardner,) give the following explanation of the hostility shown by the writer towards their establishment:—Dr. Lardner is an intimate friend of Mr. Gurney; the Directors were at one time in treaty with Mr. G. for a railway-engine, but the negociation was broken off because the Directors would not consent to a very extraordinary condition proposed, namely, that *one-half the price should be paid before the engine was made;* and hence (it is alleged) the readiness which Mr. G.'s friend, Dr. L., has shown to give credit to every sort of charge against the Directors.

Mr. Perkins and the same Company.—It appears from the pamphlet to which we have just adverted, that " Mr. Perkins is engaged in adapting his invention for improving the circulation of the water in the boiler to one of the Company's engines, which they have cheerfully placed at his disposal for the purpose of experiment." The *Athenæum* of Saturday last has on this subject the following paragraph:—" We are enabled to state, that during the last 14 weeks, in which period Mr. Perkins has been engaged in the application of his principle on the Liverpool and Manchester rail-road, one of the locomotive engines employed thereon, having his lining or circulator introduced into its boiler, has, during 360 successive journeys, to and fro, between Liverpool and Manchester, run upwards of 20,000 miles without the slightest appearance of wear and tear, the tubes of the boiler, at the end of the journey, being as free from corrosion as at the first moment of their use, and with a saving of fuel to the extent of forty tons, when contrasted with the ascertained consumption of another locomotive engine drawing equal weight."

Watering Milk.—All milk is more or less watered; but when the dilution is carried to a great extent, it is easily detected by the taste and colour. To get over this difficulty the milkmen, or, to designate them more properly, the *watermen*, have of late made use of an emulsion of sweet almonds, by means of which they can give a milk-white to 30 pints of water, without communicating to it the least unpleasant taste.—C.

Ancient Price of Silk.—What the exact price of silk was on its first appearance in Rome, we are not informed; but it must have been enormously high, for even in the latter part of the third century the Emperor Aurelian, when his wife begged of him to let her have but one single gown of purple silk, refused it, saying he could not buy it at the price of gold. We find, too, by the Rhodian naval laws, that unmixed silken goods, when shipwrecked, if they were saved free from wet, were to pay a salvage of 10 per cent., as being equal to gold in value.

Mr. Brunel's New Mode of Arch Building.—Mr. Brunel has constructed, on the premises of the Thames Tunnel Company, an experimental arch, the object of which is to demonstrate that arches of the most extensive spans yet known may be made without the costly apparatus of timber centering. It consists of two semi-arches springing from one pier; one of them the portion of an arch exceeding 100 feet span, and the other the portion of an arch of about 80 feet. A weight of about 11 tons of iron is suspended at the end of each semi-arch, to prove its stability. The elevation of the arch is one-tenth of the length of the chord. The total weight of this experimental structure is 110 tons.—R. H.

INTERIM NOTICES.

Mr. Shalders' letter is in type, but unavoidably deferred from want of room till next week.

Communications received from Mr. Rutter—C. G. J.—A Locomotionist—Rusticus—W. X.

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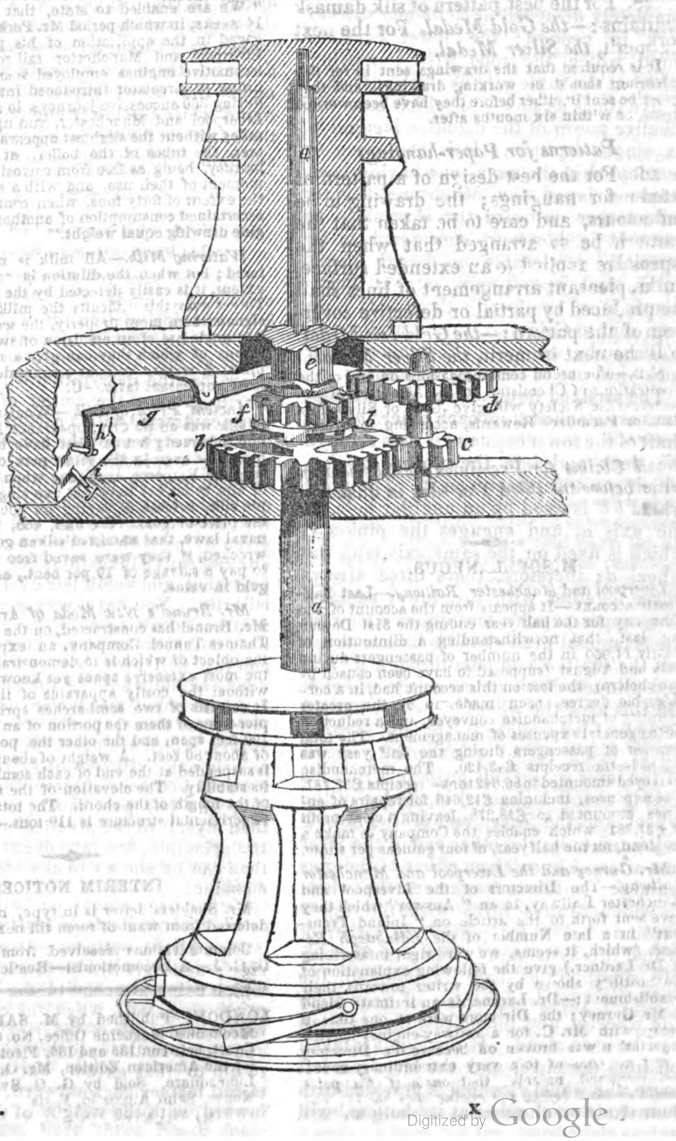
MEDLEN'S CAPSTAN.



MEDLEN'S CAPSTAN.

(From the Transactions of the Society of Arts for 1832. Part I.)

The great merit of Mr. Medlen's capstan consists in the simplicity of its construction, its small liability to be injured, and the facility with which the two capstans of which it consists may be either completely detached or combined so as to work in concert; the lower capstan, round which the rope passes, moving either at the same rate as the upper one, or five times as slow—in which case the effective power of the machine is equal to six single capstans. It is beginning to be adopted in the navy, one having been fitted on board the Maidstone frigate, and another on board the Rose sloop of war. It is, however, considered to be especially serviceable on board sheer-hulks, and, accordingly, one at Portsmouth is so employed; three also have been sent to Gibraltar, five to Malta, two to Bermuda, and two to Trincomalee, for dock-yard use at those naval stations.

The prefixed figure shows the two capstans as detached from each other. *a a*, the shaft of the lower capstan; it rises through the deck and into the upper capstan, which can turn freely on it. The great wheel *b b* is fixed by an angular hole on the axis *a*, and engages the pinion *c*, which is fixed on the same axis with the wheel *d*; therefore, these three always move together with the lower capstan. The upper capstan terminates below in the octagonal neck *e*, and is hollow to admit the shaft *a a* to pass through it, and is continued down as low as the wheel *b*. On this neck the wheel *f*, which has an octagonal hole, slides freely, and is capable of being raised or lowered by means of the lever *g*: for this purpose a ring fits loosely round a channel in the top of the wheel, and the forked end of the lever *g* is jointed to it; the other end of the lever has a loop *h* to catch on either of the pins *i* and *j*. In this arrangement the wheel *f*, which always turns with the upper capstan, has three places, in either of which it may be put. When in the middle situation, as here represented, the teeth are just dropped out of gear from the wheel *d*, and therefore either capstan can be used alone. If the loop *h* is taken off from the pin *i*, and the lever *g* is left loose, the wheel *f*, which is provided with four studs or clutches at its bottom, will drop on to the wheel *b*, and, by its studs, engage the cross-arms of that wheel, and then both capstans are united so as to be obliged to turn together; but when greater power than that is wanted, the lever is to be pulled down till its loop *h* catches on the pin *j*; this raises the wheel *f* out of connexion with the wheel *b*, and brings its cogs in gear with those of *d*; the communication of the two capstans is then only through the wheel and pinion *d c*, and these are so proportioned as to make the upper capstan go five times round while the lower one goes once, and therefore in power is equivalent to the addition of five capstans to the lower one.

SHALDERS' PUMPS—LETTER FROM MR. SHALDERS TO MR. BADDELEY.

Sir,—As your remarks in the Mechanics' Mag., for 1st Dec. last, contain *no* infamous insinuation of wilful perjury, you will be pleased to consider my late notice as not at all applying to you. I allow that the description which Mr. Ben. Martin gives of the action of his pump, when contrasted with a part of the description I have given of the action of my gravitating expressing fountain, is calculated to lead an unscrutinising reader to conclude that our machines are similar. But then the drawings and descriptions given by us both of the several parts of our respective inventions destroy that expectation, and annihilate every idea of similarity. You have very properly given a correct drawing of all the parts of Martin's pump, to assist me in its dissection; and this will prove a very short work indeed, as the whole of the hydraulic parts in his machine amount in number to no more than three, that is, exclusive of the valves, which are parts neither of us claim as original. *Apropos* of valves, however, I would just here observe that my eldest son, who has paid much more attention than myself to the practical adaptation of the principle, has introduced better valves than can be shown in any other hydraulic machine.

The Three Parts of Martin's Pump.

Part 1 is a cylinder; Part 2, a brass ring; and Part 3, a large piece of leather, which being attached to the cylinder and to the ring, will, when the cylinder is 12 inches wide, allow the ring to move up and down in the cylinder nine inches, or to dip to that extent, but as the unsustained leather bags outward, and collapses inward, with the weight of the rising co-

lumn of water, the effective dip or stroke becomes much shorter,—the ring moving up the cylinder a long way before the leather can take effective hold of the water. All this causes such a distressing and destructive action, that Mr. Ben. Martin's pump failed entirely, and this notwithstanding its delivering (by wire drawing) more water than the pistons displaced; which, if true, was clearly a defect, and not an excellence. Rather than manufacture machines with any one of the three parts used by Martin for his pump, I must abandon the ART (which my invention has exalted to the SCIENCE) of raising water for ever. It is quite obvious that any person is at liberty to manufacture Mr. Ben. Martin's pumps, and continue to use a cylinder, a ring, and a similar piece of leather. Besides, there are other frictionless pumps, and without leakage, as well as Martin's;—the powder-puff pump, the hydrostatic bellows pump, the common bellows PATENT pump, &c. &c. But where, amongst all their lumber, can you find even one of my *distinguishing and indispensable* THREE CONES, *with their specified proportions?* These are the passive cone, the flexible cone, the active cone; and the union of the three cones gives perfect effect, elegant action, and durability to the fountain pump. Mark: as the active cone reciprocates, it sustains the flexible cone; as it elongates, the passive cone equally supports the flexible cone in its evolutions; while the three cones, with suitable valves, form a perfect hydraulic machine, being then ready for the tubes and the mechanical part, and applicable for manual or any other moving power for the purposes of raising water one foot or one thousand feet high. The reciprocating rolling principle of the fountain being entirely new, it is not to be regarded as an improvement upon any machine, but as the completion of the art of raising water; and as any able dissector would find more resemblance between a lion and a lobster, than can be found between my fountain and Martin's pump, I shall dismiss that part of your notice which so rashly asserts that they are identical.

Mr. Hebert, in his graphic illustration, makes a part of my fountain perform MIRACULOUSLY, by showing only two cones; and the water, in defiance of its natural gravity, is represented as taking the highest level first: yet that gentleman would be surprised to see the river Thames refuse its natural channel, and sweep boldly over London Bridge. Mr. H. might well remark, "*without doubt, Shalders's is a very effective machine,*" and need not to have added "for temporary purposes." As there have been three No. 8 fountains constantly worked amongst the best London pumps for many years, in the largest tannery in Norwich, and the proprietor declares that they save him twelve shillings per week, which sum, worked at five per cent. for twenty years, amounts to more than a thousand pounds,—truly this is a *saving go*, accumulating for permanent purposes. How many machines my invention will be like, I dare not pretend to know. Professor Millington, in his work, at page 321, says, it is like the hydrostatic bellows,—that it is an effective pump, and possesses, in consequence of its diminished friction, advantages in some cases and situations, though it cannot be used for great elevations. If the learned professor, however, had noticed Mr. Bevan's statements at vol. 3, page 69, of this popular work, he would not have so concluded,—as a stoutish ox-hide connector will at each end support 1,000 lbs. pressure per square inch, and to raise water 100 feet requires 43 lbs. 6 oz. only. In fixing a fountain, more than a year ago, 101 feet long, for a mansion requiring for coaches, horses, garden, &c., a large supply of water, under a guarantee to keep it in order for years free of expense, I proved that a fountain had two strings to its bow, and a pump only one; for when the lower valve was slightly choked, the only inconvenience experienced was the rising of the lever, and it was worked in that state for weeks, until the valve cleared, while a common pump would have let all the water repass its piston, and remained useless, without an expensive undertaking. Fountains perform invariably. When fixing a No. 16, in the well belonging to the mansion of William Unthank, Esq., Norwich, about six months ago, I ordered 3 lbs. of water to be lifted 66 feet high at each stroke of a lever, when moving through ten feet space, with an average rising force of 14 lbs., and a falling force of 26 lbs. The order was executed, the moving power ascertained with a spring steelyard, and things found as they should be. He who expects to raise more water with that power, is ignorant of mechanics; he who cannot raise as much, cannot make a good machine. So steadily too, and so certainly, do these giant bantlings perform, that you may work them at 4 or 4,000 strokes per hour, and the same quantity of water per stroke will be delivered. Many of them have been much worked for years, without costing a penny, or ever failing a drop of water per stroke in quantity.

I have not overrated the superiority of the fountains; they are applicable for navigation, and not totally unfit for fire-engines. I have not instituted trials against

pumps with worn-out cylinders, harsh piston leathers, or of bad construction, which are in large supply; but waterways in pumps equally capacious with fountains are not practically attainable. The trials have been made only against the very best common pumps, when in their best working state, and all of them delivering a little more water in a minute than what is stated by their GREATEST CAPTAIN, MR. BOOTHE, who, when supplying Mr. Fergusson with the popular scale for pumps, remarked, that he had repeatedly proved that a man could with a good pump raise 27½ gallons of water, English wine measure of 231 cubic inches, in a minute to 30 feet high. Mr. Watt would have, more agreeably to modern science, stated it to be 6870 lbs. one foot high. Mr. Smeaton says, "for my own part, I have made many machines, and many observations upon machines made by others, but could never find a pump with which a man could raise a hogshead of water (wine measure of 63 gallons) to 10 feet high per minute, only when working for a few minutes in haste or distress." These quantities of water are frequently more than DOUBLED with the fountains; and I have claimed, for the abolition of friction and leakage, only 173 against 100, and will not abate one unit until I am beaten out of it by actual trial, with all above board, fair play, and daylight. Therefore, I say, COME ON. No series of experiments are wanted. Make or procure the best pump you can, and I will make the best fountain for the power of one man, fit for shipwork: the length is of no importance; but to raise water 10 feet has always been the standard height for pump trials by men of science. *That the fountains are in every respect, for ships' purposes, beyond all comparison the best hydraulic machines that have ever appeared, there is an overwhelming host of incontrovertible testimonials, besides what has already been noticed in the Mechanics' Magazine.* Likewise the following case practically establishes for ever the immense value to the public of the invention:—

In September, 1831, Messrs. Youngs, Alderman Burt and Son, Norwich, ordered an expressing fountain to be fixed, to supply water for one of their malting offices, &c., which fountain has yet wanted no reparation. Finding it produced the desired effect so well, they were induced about seven months ago to take down their treble-motion horse-pump, which raised water 44 feet for their brewery refrigerator, &c., and substituted a treble-motion fountain in its place, attaching the same to the same feed-pipe and rising-main, to be worked by the same horse-mill. The instant the good principle was substituted for the bad one, it was discovered that one horse raised all the water required as well as two horses could before, when the pumps were in their best order; and matters have so continued ever since. Four months, however, after fixing, the lower valves choked, and enough of sand, gravel, &c., was found in the fountain to have destroyed the packing of the piston, and injured the cylinders, of friction-pumps, but the connectors had taken no harm; and I am happy to find that connectors to the amount of a very few shillings annually will be all this fountain can possibly want, although one of the largest breweries in this city; and I know of no machine that does more work.

But what I wish more especially to notice is your very strange assertion, that the fountain is totally unfit for a fire-engine. The result is quite the contrary, as the fire-engine hose formerly used with the pump I have just mentioned is continued with the fountain; and Mr. Henry Lock, civil engineer, who fixed the machine, considers that the circle of the delivery of the water from the jet is extended at least 30 feet by the new principle.

Here ends my reply. But, Sir, the main thing for success in the art of raising water is to be able to calculate *force and resistance*. Suppose you have a force of 30lbs., which moves through 10 feet space, what quantity of water is it possible to raise to 1 foot 10½ inches, 7 feet 6 inches, 30 feet, or to 120 feet altitude, with that power? Mr. Boothe would say, use a 16 inch cylinder, an 8, a 4, and a 2 inch, for your pumps, and the columns of water will all weigh alike. So far, so good; and the results are, when unencumbered with friction, &c., to the first height 160lbs., second 40lbs., third 10lbs., and fourth or the 120 feet 2½lbs. of water raised; but to add one ounce is utterly impossible. And thus we may ascertain by calculation whether a performance be good or bad.

Example. If one horse, according to Mr. Watt, raise 33,000lbs., or 528 cubic feet of water, one foot in one minute, 6 horses in 10 hours must raise 38,016 cubic feet of water 50 feet high for perfect effect.

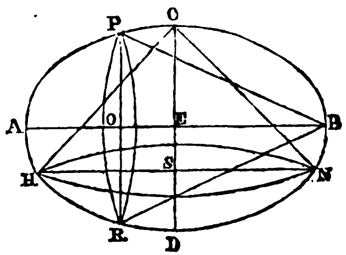
If I have by affidavit obtained my patent through ignorance, or a worse intention, as infamously stated (p. 71), the more manly way to vacate the patent is by applying to the Court of Chancery for a *scire facias*, which, upon affidavit, will issue on the authority of the Attorney-General; but for any person to act under your authority would be dangerous.

I am, Sir, yours truly,

W. SHALDERS, Patentee.

Bank-place, Norwich, Jan. 22, 1833.

SOLUTION OF THE FIRST OF THE MATHEMATICAL QUESTIONS, p. 157.



QUESTION.—*To incribe the greatest cone in a given spheroid.*

Let ACBD be a spheroid, generated by the revolution of the semi-ellipse about the axis AB, and let PRB represent the greatest inscribed cone. Assume d and b = transverse and conjugate axes; put A o = x. P $o = y$, 3.14159, &c. = P. Then o B = $a-x$, and by the property of the ellipse $a^2 : b^2 :: x\,(a-x) : y^2 \therefore y^2 = \frac{b^2}{a^2}$ $(a\,x-x^2) \therefore \frac{b^2\,P}{3\,a^2}(o\,x-x^2)\cdot(a-x)$ = content of the cone. PRB = max, or $x(a-x)^2$ = max. Differentialing we have $d\,x\,(a-x) + d\,x\,(2\,x^2-2\,a\,x) = o$, or $3\,x^2 - 4\,a\,x + a^2 = o$.

Solving this equation, we obtain $x = \frac{a}{3}$ consequently o B the axis of the cone is $\frac{2}{3}$ of A B. But another cone C H N may be inscribed in the spheroid, having its axis C S parallel to A B, and the content a maximum. Proceeding in the same way as above, we will find that the axis C S $= \frac{2}{3}$ of C D, or $\frac{2\,b}{3}$. It therefore only remains to determine which is the maximorum? In the first case the expression for the content of the cone P B R $= \frac{b^2\,P}{3\,a^2}$ $(a\,x-x^2)\cdot(a-x) = \frac{4\,P\,a\,b^2}{81}$, and in the second case the content of the cone HCN will be $\frac{4\,a^2\,b}{81}$, or the cone P R B : cone C H N : b : a, and since a is the axis major $\therefore$ The cone C H N is the greater of the two.

KINCLAVEN.

POLYCHREST LAMPS.

Sir,—I have seen several of these lamps to which there has been attached what appeared to be a large ball of spongy platinum, but which proved on examination to consist of some common material resembling cotton, merely overlaid with a thin coating of the metallic preparation. In consequence of this deception being practised by the vendor, the lamps soon cease to perform their office of fumigation, and by those who do not understand their principles are thrown aside as useless

There is nothing better than platinum wire for producing the slow combustion of the vapour of alcohol. I have at different times fitted up several of these lamps for my friends, and they are now as effectual as they were twelve months ago.

Coil about two inches of fine platinum wire round the point of a common lead pencil, leaving half an inch to thrust into the wick. It will present a conical form, thus,

and for the purpose of curiosity, or of occasional fumigation, the wire will last for several years. As a perfume, I have used a variety of articles, such as camphor, oil of lavender, bergamot, and otto of roses; but there are none, I think, more generally agreeable than gum benzoin. Half an ounce of the gum will flavour a pint of spirits of wine. Cascarilla bark might also be used as a perfume. The spirit should be filtered before it is put into the lamp; and if a little infusion of litmus or cochineal be added previous to filtration, it will have a more elegant appearance.

J. O. N. RUTTER.

Lymington, Jan. 21, 1833.

CAOUTCHOUC BALLS.

Sir,—A gentleman has kindly suggested to me that caoutchouc (India-rubber) balls would probably answer better than bladders for holding gas, as described p. 280. I have always used bladders, because in the country they are easily obtained, and at a very cheap rate,

their usual price being from threepence to sixpence each. I readily communicate the hint, only observing, that as explosion cannot possibly occur in the arrangement I have described, it is likely that the additional expense of caoutchouc would be fully compensated by its durability as compared with bladders. I understand that the balls, in every variety of size, are prepared by Mr. Hancock, Agar-street, Strand.

J. O. N. Rutter.

Lymington, Feb. 2, 1833.

RECENT AMERICAN PATENTS.

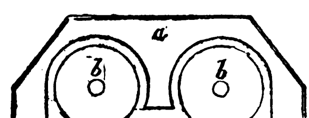
With Remarks and Exemplifications by Dr. Jones.

(Continued from the Franklin Journal.)

Hat Stiffening Composition. *Chas. Bent and Francis Bush.*—The materials to be employed in forming an elastic waterproof stiffening for hats, are borax, rosin, shellac, and copal. Eight ounces of the first, one pound of the second, two of the third, and five ounces of the last, are to be dissolved in five quarts of hot water, the ingredients being put into it in the order stated. The hat bodies are to be saturated with this compound, and then trenchered, leaving the larger portion of the stiffening in the brim. After standing half an hour they are to be put into a weak solution of sulphuric acid, and then soaked in cold water until all the acid is removed, when they are ready for napping. The patentees state that this process is much cheaper and better than those usually followed, and that by its aid a workman can stiffen three times the number that can be stiffened by the usual method.

Looking-Glass Backgrounds. *Isaiah Jennings.*—The end which the patentee has sought to attain is the formation of an aerial background to pictures and other ornamental articles, by which they receive an appearance of more perfect relief than by any mode of procedure hitherto known. The following is his own description of the different processes by which this may be effected:—I sometimes take a plate of glass which has not been silvered, and I draw upon it such portrait, picture, ornament, or device as may be desired, in one or more colours; or I stain or enamel the same upon the glass; and after such picture or device is finished, I proceed to silver the glass, on the same side with the picture or device, in the ordinary way of silvering looking-glasses. Or, instead of silvering the glass upon which the picture or device is painted, I place behind it a plate of looking-glass, securing the two glasses in any suitable frame, the painting or device inwards. When the picture or device is formed upon paper, or any other material which can be cut out, I carefully cut the said picture or device from its ground, and then lay the ground upon the silvered side of a looking-glass, and trace the outline of the picture or device thereon, through the silvering. I then remove the silvering within the said tracing, and apply the picture or device in the space thus formed, securing it by a suitable backboard, or otherwise. Or I place the said picture or device between a plain and silvered glass, which produces the same effect as the foregoing. At other times I trace the outline, and remove the silvering, as in the last example, and then paint the desired picture or device upon the glass. In either of these modes of procedure a similar effect is produced.

Ruler for Counting Houses. *Israel Pellew.*—This is intended as a substitute for the common round ruler, to which it is certainly much superior. It consists of a piece of mahogany or other wood, made in the form shown at *a*, which is a transverse section of it. There are two grooves along the under side of it, to receive the two parallel rollers *b b*, which



extend its whole length, and revolve on pins running in metal plates at each end of the ruler. The tendency of this ruler is always to run parallel; it does not readily slip like the common ruler; the bearing of the pen or plummet is near to the paper, whilst the rollers keep the ruler sufficiently elevated to prevent all danger of blotting.

Flattening Window Glass. *John J. Adams.*—The apparatus here patented is intended for flattening cylinder window glass. It consists of a circular oven, or flattening surface, having in it a circular railway of cast iron, upon which the flat-

tening apparatus can be made to revolve. The cylinder is to be put in through the stick hole, and, as it is acted upon by the fuel, is carried round until it arrives opposite to one of the flattening mouths, where it is flattened out upon a stone in the usual manner. By further turning, it is carried round until it arrives at what is called the cooling arch. This is an arch of about thirty feet in length, and three in width; within it two endless chains pass over rollers which cross it at suitable distances, for sustaining the chains. Upon these chains are keyed plates of sheet iron, about three by two and a half feet, upon one of which the flattened plate is laid from the flattening apparatus; the endless chain is then carried forward by turning a winch until another sheet of iron presents itself to receive another plate of glass; the plates are thus gradually carried along the cooling arch until they are ready to be delivered from the far end. The plan of the cooling arch is similar to that of the annealing ovens at the flint glass works, and would undoubtedly answer the intended purpose; we have not equal confidence in the annealing furnace, and the apparatus within it.

SUPPLYING STEAM BOILERS. *Jesse Fox.*—Those who are well acquainted with the different modes which have been adopted for supplying boilers with water, know that it is sometimes done by causing a cylinder, or a conical plug, to revolve in a suitable case, like the key of a cock in its socket, and having at one point a cavity within it, which, as it turns, is filled with water from a reservoir above it, and in its revolution delivers it therefrom into the boiler. The plan before us is of this character, but in the structure and arrangement of its parts appears to be new and well conceived. The revolving piece, which has the cavities in it for the reception and supply of water, is a cylinder of iron, four inches and a half in diameter, and one and a half in thickness; this cylinder revolves on a suitable axis, being enclosed for more than half its circumference in a casing, which is furnished with a flanch, by which the apparatus is attached to a boiler. A hole is made in the boiler to admit a projecting part of the revolving supply wheel, which is nearly equal to one-half of it. This wheel is perforated on opposite sides, so as to remove nearly one-half of its substance. Imagine it to be divided into four parts, or quadrants: the part removed consists of two opposite quadrants, leaving a rim, however, of one-fourth of an inch in thickness at the outside, and an equal portion round the gudgeon at the centre. These cavities, as the wheel revolves, are alternately exposed to the pressure of water in a reservoir from which they are filled, and to the inside of the boiler, into which the water falls from them, both sides of the wheel being equally acted upon by the steam. The perforation of the boiler is at the point intended for the water line, in order that the tendency of the wheel may be to carry back as much as it supplies when the boiler is sufficiently full. A principal objection to revolving wheels of this description is their gradual wear, which although they may operate satisfactorily at first, soon unfits them for the duty they are to perform. Should this objection be removed, the principle is undoubtedly a good one.

NEW BUILDING ACT—EXPEDIENCY OF LIMITING THE NARROWNESS OF STREETS, COURTS, ALLEYS, &c.

Sir,—On a former occasion I sent you a list of subjects requiring consideration before the proposed New Building Act is passed into a law. I beg now to offer another, which has lately occurred to me, to the attention of your readers.

The very great importance of forming new streets through densely populated districts is becoming every day more and more apparent, both for improving the health of the metropolis and for the prevention of crime. While the injurious tendency of crowding houses so closely together is so manifest, and so much expense is incurred in removing the evil in various directions, there is yet no law to prevent such nuisances from again accumulating. But since it is admitted that "prevention is better than cure," it appears to me but reasonable to think that some scale of limitation ought to be formed for density of population. Should the Building Act be introduced into Parliament during the approaching session, I will again direct my attention to this subject.

I am, Sir, your obedient servant,

JOSEPH JOPLING.

33, Sloane-street.

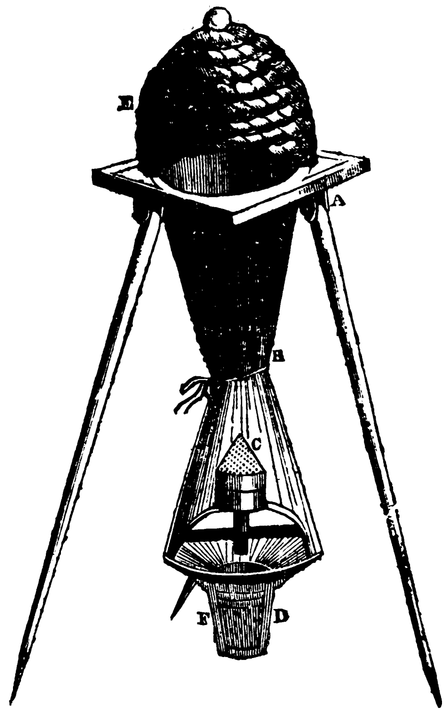
NUTT'S SAFETY-FUMIGATOR.

(From Nutt's "Humanity to Honey Bees.")

Fumigation is a rather portentous word; but, as soon as I shall have explained for what purposes, and in what manner, I occasionally make use of it, it will be totally divested of all *deadly* signification. In my practice it is not a bee-destroyer, but a bee-preserver; when resorted to in my practice it is never carried, nor intended to be carried, to suffocation: but, in the operation of uniting weak swarms or poor stocks with more wealthy and prosperous ones—which I consider to be a meritorious and most humane practice —when it is necessary to examine the state and condition of even a populous colony, should unfavourable symptoms as to its healthiness or its prosperity manifest themselves,—when it is known, or but suspected, that there are wax-moths, mice, spiders, or other bee-enemies, lodged in a hive, which the bees of themselves cannot dislodge nor get rid of, and which, if not got rid of by man's assistance, would soon destroy almost any colony,— when bees and their works (for I never transfer the former without transferring an ample sufficiency of the latter at the same time) are to be taken out of a decayed straw hive, and to be put into a more substantial one, or into collateral boxes, which I hold to be the best of all hives,—and on innumerable other occasions, it is absolutely necessary *to subdue bees* so far as to render them incapable of using that formidable, venomous, little weapon with which Providence has armed them, and which generally dreaded little weapon they can use so dexterously before we can operate upon them for their own good. By means of a very simple apparatus, which may be called *a fumigator*, and which is a contrivance as novel and as useful in the management of bees as any of my hives or other inventions, *bees may be totally subdued without being injured in the slightest degree, and dealt with as if they had neither stings nor wings.*

I beg, however, to re-state distinctly —that, in taking off a box or a glass of honey, *no fumigation whatever is necessary*, or ever practised by me. It is only in cases such as those just enumerated that I have recourse to it; but in no case for the destruction of bees. Fumigation, therefore, in my practice, is not suffocation.

The following figure is a representation of a fumigator, which a brief explanation will render intelligible:—



This useful article consists of a square top-board, upon which is placed a straw hive (E), so as to show an open, circular space under the hive and through the square board into the bag below. I need hardly observe, that the straw hive is no part of the fumigator, but is here represented as standing upon it in order to exemplify its use. The top-board is of inch deal, and is nineteen or twenty inches square. A round piece is cut out of its centre of not more than thirteen inches in diameter—that being something near to, or perhaps rather more than, the inside diameter of a common hive—so that a hive will stand upon the wooden circumference of the part left, without there being any ledge inside, that is, any part so inclosed by the hive

as to catch and detain the falling bees. From the upper edge of this circle is suspended a bag, a yard in length, made of glazed calico, the bottom part of which draws round the rim of a shallow, funnel-shaped, tin bee-receiver, which bee-receiver is about ten inches across at the top, and its lower part, or neck (D or F) is three inches and a half in length, and its throat (if I may so term it) is nearly three inches in width. To fit this neck, which is thickly perforated for the purpose of admitting fresh air when fresh air may be required, is a close lid, just like that of a common tin canister, to hold up the fumigated bees, and also to stop the ventilation when not wanted. C is the fumigating lamp, with a perforated top through which the fume ascends, and is made conical, that so a fumigated bee in its fall cannot rest upon it, and be thereby scorched or injured, as would inevitably be the case were this top flat. The tie (B) closes the bag and keeps every bee above until the lamp and every thing below be adjusted, and it is *then* to be untied. The fumigator is here represented as standing upon three legs made fast to the top-board by small bolts, as at A; but it is quite as convenient in practice, and more portable, if, instead of these legs, it be made like a common scale with a cord from each corner, which may be gathered into a small iron hook, and thereby suspended from the branch of a tree, or from any other convenient place, when used; the lower part of the bag is represented as being transparent, but that is done purposely to show how the lamp is placed inside when prepared for operation.

By persons inexperienced in such matters, it may be thought to be an extraordinary feat to unite the bees of one hive with those of another—to bind, as it were, the legs and wings, and *pro tempore* to render useless the sting of every individual bee, until such union be effected. Nothing, however, is more easy; nor is any part of apiarian practice attended with more pleasing consequences to the operator, or with more important and beneficial results to the bees themselves. When in a state of temporary intoxication from the fume made to ascend through the perforated tin (C) into their hive, these beautiful insects are perfectly manageable,—perfectly harmless.

This intoxicating fume is caused by introducing into the fumigating lamp a piece of ignited vegetable substance, called puck, puckball, or frog-cheese, or, most commonly, *fuzzball.* It is a species of fungus, or mushroom, and is plentiful enough in the autumn in rank pastures and in rich eddishes. Shepherds, milk-maids, or country schoolboys, are well acquainted with them,—know very well where to find them,—and for a mere trifle will easily pick up as many of them as will supply the demands of twenty apiarians. They are frequently as large as a man's head, or larger. In 1826, I had an unripe white puckball which weighed ten pounds. When ripe they are internally of a brown colour, and turning to powder, become exceedingly light, and are then properly *fuzzballs.* When you have procured one of these pucks, put it into a large piece of stout paper,—press it down therein to two-thirds, or, if you can, to one-half, of its original size, and tie it up very closely,—and, lastly, put it into an oven some time after the household bread is drawn, that is, when the oven is nearly cool, and let it remain there all night, or until it will hold fire, and smother away like touchwood, *i. e.* burn without kindling into flame. In this state it is fit for the lamp, and may be used in the manner following:—

Take a piece of this prepared fungus, as large as a hen's egg (it is better to have too much of it than too little to begin with); ignite one end of it with a candle, and then put it into the fumigating lamp; next fix the lamp in its socket over the bee-receiver, and place the whole inside the bag, as shown in the plate, and untie B, the fastening round the middle. In a very short space of time the bees in the hive placed upon the top-board (which is necessarily the first thing to be attended to in every operation of this kind) will be totally under your control. The operator should be particularly careful to close every vacancy, however small, that there may happen to be between the top-board and the edge of the hive, by tying a cloth round it—the hive—as soon as ever it is placed upon the board. This precaution will prevent the escape of any of the fume, and will also prevent the bees from annoying the operator during the fumigating process.

In the course of a minute or very little more you will with delight hear the bees dropping like hail into their receiver, at the bottom of the fumigating apparatus.

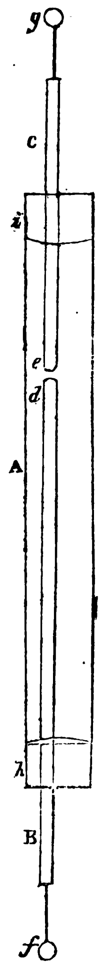
When the major part of them are down, and you hear but few fall, you may beat the top of the hive gently with your hands, in order to get as many down as you can. Then loosening the cloth, lift the hive off and set it upon a table, or upon a broad board, prepared for the purpose, and knocking the hive against it several times, many more bees will fall down, and perhaps the queen amongst the rest; for as she is generally found to lodge near the crown of the hive, she often falls one of the last. If the queen is not among the bees on the table, then search for her among the main body in the bee-receiver, first, however, putting them upon the table, if you discover her not before lying among the uppermost bees therein.

During this search for the queen you must be proceeding in a similar manner with the bees in the other hive, with which those already fumigated are to be united. As soon as the bees of the hive last fumigated are all composed and quiet, and you have found and secured one of the queens, you may put the bees of both hives together into one, mingling them thoroughly together, and sprinkling them at the same time with a little ale and sugar; then put them and *one only* of the two queens among the combs of the hive you intend them to inhabit, and gently shake them down into it. When you have thus got all the bees of your two hives into one, cover it with a cloth and bind the corners of that cloth close about it, and let them stand during that night and the next day, shut or closed up in this manner, so that a bee may not get out.

In the evening of the following day, at the dusk hour, loose the corners of the cloth and remove it from the mouth of the hive (taking care of yourself), and the bees will with a great noise immediately sally forth; but being too late to take wing, they will presently go in again; and ever after remain satisfied in and with their new abode—new, at least, to one half of them, and new to the other half also when transferred into a fresh hive, or into boxes.

ELECTRICAL EXPERIMENTS—DECOMPOSITION OF WATER.

Sir,—A description of the following cheap and simple apparatus, for exhibiting the decomposition of water by common electricity may probably be interesting to young experimentalists.



A is a piece of glass tube, say five or six inches long, and one-half to five-eighths of an inch diameter, the ends of which should be filed or rubbed smooth. B C are two pieces of thermometer tube, at whose extremities, *d e*, half an inch of very fine gold or platinum wire must be in-

serted. The ends of the tubes should be fused, so as firmly to retain the wires. This can be easily effected with a blow-pipe and spirit lamp. The finer the wire is the better. After fusion, should the wires project, they must be cut or ground down parallel with the ends of the respective tubes. *f g* are two pieces of brass or copper wire, passing throughout the whole length of the tubes B C, and in contact with the gold or platinum wires at *d e;* with a little care, these wires may be united to the tubes at B C, by fusion. *h i* are corks, nicely adapted to the ends of A, and through which the tubes B C pass. If these corks be covered with sealing-wax, it will give to the apparatus a more workman-like appearance. The mode of operation is as follows:— The cork at *h* being permanently fixed, fill the tube A with water; insert the cork *i*, so that the points *d e* shall be within an eighth of an inch of each other; attach the wire *f* to the discharging rod, or, which is much better, to Cuthbertson's grain weight electrometer, holding the other end of the apparatus *g* in the hand. When the machine is in action, bring the ball of the discharging rod, or of the electrometer, as the case may be, to within a rapid striking distance of the conductor, when brilliant sparks will be seen to pass from *d* to *e*, decomposing a minute quantity of water in its transit. The success of the experiment will be manifested by bubbles of gas (oxygen and hydrogen) ascending through the water. With this simple apparatus I have collected a sufficient quantity of gas to produce an explosion with a taper. It is important to remember that a continuous flow of the electrical fluid is not sufficiently energetic to resolve water to its elementary principles. The intermitting spark is essential to the due performance of the experiment. If the tube at *g* be connected with the floor, the results are not so satisfactory. The human body is a more perfect conductor than the floor; hence I find the evolution of gas is most abundant when the positive end of the apparatus communicates with the hand.

The decomposition of water by a galvanic battery is more imposing than by the process I have described. This experiment, however, is interesting, because it demonstrates the identity of common and voltaic electricity. I expect we shall soon have farther proof of the identity of electricity and magnetism, in the decomposition of water through the sole agency of the magnet.

I am, &c.,

J. O RUTTER.

Lymington, Jan. 29, 1833.

THE PERFECTION OF MACHINERY.

A Proposition for the Consideration of Mechanics.

Let there be a machine room erected in the middle of a garden, and fill it with wheels, pinions, electric cushions, cylinders or plates, and properly disposed conductors, to be driven by a steam engine, &c., so as to impregnate the adjacent garden with a due portion of electricity, to regulate the heat of the same, so that frost shall be driven entirely away in the winter. All this I lately saw in my brother's garden, when the peas were up and ready to blossom, and a fine bed of mint ready to make sauce, and every thing in a very forward state, quite green and beautiful, although the surrounding fields were locked up by frost, and covered with snow; it was a most charming sight. Moreover, the machine room was a very beautiful room, elegantly fitted up with scarlet furniture, and every thing covered over with a warm colour, quite delightful to behold. If you think this communication worth inserting in your valuable miscellany, I will shortly write again, and inform you where I saw these wonders.

I am, Sir, your humble servant,

MARY.

February 2, 1833.

THE PADDINGTON AND LONDON STEAM-CARRIAGE COMPANY.

(From a Correspondent.)

The first carriage of this Company was exercising along the Mile-End, Hackney, and City roads, on Saturday last (26th Jan.) about noon; and is now in the painters' hands, on their premises, Wellington Foundry, Charles-street, City-road, for completion, which is expected to be in about a month, when she will commence running for hire on the road, but only for a few journeys per day until two more carriages are completed, when the whole will ply regularly between Paddington and the City. It was thought by the Managers prudent to see one car-

riage actually in action, in a finished state, before the others were put in hand, in order that they might avail themselves of any improvements that the performances of the first may suggest.

FREEZING OF GAS METERS.

Sir,—I am greatly obliged to Mr. Baddeley for his communication, page 270. It fully confirms my own conjectures, and verifies the statements made to me by others.

If gas-fitters, or those who employ them, were to exercise their judgment when they fix the meter, I think, with Mr. B., there would be very little risk of the water becoming frozen. In a shilling work* I have lately published, are the following hints on this subject. They may probably be useful to some of your readers:—

"In choosing a situation for the meter, it is advisable to place it in as equable a temperature as possible. If the situation be too warm, the water will evaporate; if too cold, in winter it will freeze. Those which are necessarily fixed in a cold situation, should be protected from frost by being covered with some non-conducting substance, we know of nothing better than dry sawdust."

Spirits of wine would be found too expensive for general use as a preventive to frost. It will, moreover, very soon evaporate. For very exposed situations I can, at present, devise nothing better than what Mr. Baddeley very appropriately terms a hot bath. At any rate it is worth a trial.

J. O. N. RUTTER.

Lymington, Jan. 21, 1833.

METHOD OF CUTTING LOGS OF ANY SIZE INTO ONE CONTINUOUS VENEER.

The *Annales de Chimie* gives the following account of a new method of cutting veneers as peculiar to Russia; but if the reader will refer to the account of the American Exhibition of Arts and Manufactures, given in this Journal for March 12, 1831, he will perceive that it has been also practised for some time in the United States:—

"The machine, employed for this purpose in Russia, possesses this peculiarity—that, instead of cutting the wood from the flat and thick surface, it carries off from its circumference a continuous shaving; the result of which is, that leaves of an indefinite length are produced, agreeably veined and knotted. The construction is simple, combining the advantage of cutting the precious woods without waste, and very rapidly, to an extraordinary extent, and so thin that they have been employed for the covering of books, and for lithographic and other engraving. One hundred feet in length of veneering may be cut in the space of three minutes. They begin by placing the timber, from which the leaf is to be cut, upon a square axle, when it is revolved and made circular with a turner's gouge. The blade of a plane of highly-tempered steel, and rather longer than the cylinder, is fixed at the extremity of a frame six or seven feet in length, in such a manner as to exert a constant pressure upon the cylinder, and pare off a sheet of an equal thickness, which folds upon another cylinder like a roll of linen. The frame to which the blade is attached is moveable at its lower extremity, and, as it is charged, it depresses in proportion as the mass diminishes in substance. That this depression may be progressive and perfectly regular, the inventor has appended a regulator to the machine, consisting of a flat brass plate, preserved in an inclined position, upon which the frame descends as the regulator itself is advanced. The motion is communicated to the cylinder by means of several cog-wheels, which are turned by a crank."

NEW PUBLICATIONS CONNECTED WITH THE ARTS AND SCIENCES.

Journal of Elemental Locomotion. Edited by ALEX. GORDON, Esq., Civil Engineer. Nos. 1, 2, and 3.

We felt heartily disposed to welcome this addition to the scientific branch of our periodical literature, which is now far more narrowed than any well-wisher to it can honestly desire; but though we have waited a sufficient length of time, to allow of a full development of its pretensions, we regret to say we can report nothing good of it whatever.

The "peculiarity of feature," by which the public were assured this Journal would be distinguished, was that it would be "essentially practical." It was to contain none of "those literary *nugæ*" which abound in other journals. Now, throughout the whole of the numbers before us, there is absolutely but one piece of practical information on the subject of locomotion, namely, an account of Mr. Hancock's abortive journey to Brighton,

* Practical Observations on Gas-lighting.—Longman and Co.

a little more circumstantial than that given in the Mechanics' Magazine, but precisely to the same effect. Speculation, and nothing but speculation, of the most ideal and extravagant character, fills nearly every page. Instead of the Journal being "essentially practical," it would be truer of it to say that it is all *nugæ*—all cloud and vapour, relieved only here and there by a gleam of pure moonshine.

Mr. Gordon is an advocate for the application of steam power to travelling, but only to travelling on common roads; that is to say, a determined enemy of railways, which he declaims against in great style; although it is as clear as the sun at noonday, that if steam can be applied with advantage on common roads, it must be just as much more applicable to railways, as the friction on the one is less than on the other; that is, according to the most moderate calculations, *ten times more applicable.*

The distresses of the lower orders form a constant theme of lamentation with Mr. Gordon; but he is one of those mole-eyed menders of things as they are, who deem that the best way to relieve a suffering people is to load their trade and manufactures with as many fetters and restrictions as possible! Next to railways, the thing which he vituperates most is free trade. The opening of the Liverpool and Manchester railway is, in his eyes, a national calamity, which admits of but one consoling reflexion, and that is that it caused the death of the great champion of the free-trade system, Mr. Huskisson! As so truly atrocious a sentiment ought not to be ascribed to any man on second-hand authority, we shall quote Mr. Gordon's own words for it:—

"Our foreign intercourse, upon principles of reciprocity, has been the idol before which the neck of this great empire has bowed hitherto; and it has truly hitherto bowed our neck. *Let us learn wisdom from the past.* ALREADY STEAM HAS OFFERED UP AS A VICTIM TO THE MANES OF HIS COUNTRY'S PROSPERITY, *the prime theorist* whose liberalising tamperings with our commercial code have so copiously liberated us from national power, resources, and content, and it must go onwards trampling down," &c. &c.—p. 41.

Mr. Gordon professes to "*stand aloof from politics and faction,*"—p. 6; and yet never misses an opportunity of leaping into the political arena to assail with tooth and nail those from whom he differs in opinion. He is an ultra-Tory of the most rabid description, and is studious that all the world should know it.

Mr. Gordon's remedy for "every evil under which the country labours," is simply to kill all the horses, and employ steam carriages in their stead. But Mr. Gordon is pleased to take entirely for granted the one little fact on which the whole of his speculation turns, namely, that steam carriages really *can* do all the work of horses. We have pages on pages of verbose expatiation on the delights and benefits of travelling on common roads by steam, but nothing to show that we are one step nearer the reality than we were a year or two ago. It is with such day-dreams as the following that Mr. Gordon amuses his readers:—

"How different will it be, when the hour (*already*, by the progress of locomotive science, *put within our power*,) arrives, when from St. Paul's a steam-drag, having six or eight private vehicles attached, elegantly fitted up for moveable purposes, and accommodated with all the *necessaria* of a breakfasting parlour, will move off with the silence and almost rapidity of thought, as the bell rings six on a summer morning, each filled with a gay family party of young and old, and who, after the almost imperceptible progress of a pleasant hour's space, will find themselves set down in the Great Park at Windsor, or twenty miles distant from the capital in any given direction, having an hour and a half to stroll about, and admire nature in her loveliest aspects, and acquire courage to do full justice to the breakfast which, in the mean time, the attendants have—foraging from the neighbouring farmhouse, prepared, *fronde super viridi*, under the beechwood tree;—not indeed a *paté de Perigord*, over which a gastronome would wish to live and die, like Homer's lotus-eaters, forgetful of kith and kin, native country, and all social obligations whatever; but butter newly-churned, cream uncompounded of suet, whitening, and water, and eggs freshly laid, without the *goût* which cockneys are wont to think gives them relish. Half an hour elapsed, during which the party have marched deep into the bowels of the dainties placed before them, charged and again charged, and crowned the whole with a laced cup of generous brandy, they again step into their *maison-volage*, and the mighty drag makes nothing ado of it to set them down, exhilarated in mind, braced up in body, and ready to enter upon the business of the day, just as St. Paul's announces to the lieges that the tenth hour has commenced

its progress. This will seem to many a brilliant chimera, or pleasant hallucination—but laugh your fill; we are yet young enough to see it realised, and, over and besides, coach-horses become as rare through the length and breadth of Great Britain, as steam coaches are at the present moment."

"Young enough!" No, not though he had the vitality of a hundred Methuselahs in him. The thing on a *common road* is impossible; nature and art alike forbid it. There may be schemers who have purposes of delusion to be served by such extravagant representations, and persons green enough to be taken in by them; but no one who is acquainted with the scientific principles on which the application of steam to travelling on common roads must depend for success, and who is free from all sinister interests, can view with the least pleasure or approbation an advocacy conceived in so ignorant and so visionary a spirit.

Since the preceding notice was written, a fourth Number of Mr. Gordon's Journal has appeared. It is of a less speculative character than any of the previous numbers, but not a whit more scientific or rational. The incomparable superiority of common roads to railways, and the prodigious absurdity of free trade, are still the engrossing themes. Mr. Gordon has now reached the length of asserting that "the wear and tear of a locomotive vehicle, on a railway, is three times as great as on a common road"! p. 108. Surely hardihood of assertion *can* no farther go.

Producing Man's Companion; an Essay on the Present State of Society in England, Moral, Political, and Physical. By Junius Redivivus. Second Edition, with Additions. Effingham Wilson.

We are gratified to find that the favourable opinion we expressed of this little work has been so far confirmed by the judgment of the public that it has already passed into a second edition. We abstained formerly from canvassing the soundness of the author's sentiments on so many of the topics handled by him as are purely of a political nature; and shall follow the same course in regard to those portions of the supplementary matter introduced into the present edition which are of a similar character. We should say generally of the work, that it is more to be esteemed for a profusion of original and striking thoughts, curious observations, happy similitudes, and generous sentiments, than for either the depth, or comprehensiveness, or solidity of the views which it contains of "the present state of society in England." It is, altogether, a work more pleasing to read than safe to follow; and it is with more propriety than the ingenious author was probably conscious of, that he has named it—not a Guide but—a "Companion."

We regret to observe that the objections which we made to that part of the work which relates to patent-rights have not been considered by the author of sufficient weight to induce him to make any material alteration. In the first edition he spoke of them in this manner:—"The fact is, that the patent-right of the inventor, and the copy-right of the author, are equally *based on a species of fraud*." In the second edition this passage has been changed into the following:—"The fact is, that the patent-right of the inventor, and the copy-right of the author, are *injudicious modes* of remunerating public services, and do not accomplish the desired object." A *very* material alteration this would have been had the author only stuck by it; but in a page or two after we find the charge of fraud, which had been thus apparently abandoned, again taken up, and as broadly enforced as ever in the following terms:—"But there is great *injustice* in patent-rights at the very outset, independently of their mischievous tendency. They are *barefaced attempts to monopolise the principles of nature*," &c. Again:—"The one (the patentee) sells stolen goods, the other (the Government) buys them." Now, we must again repeat our absolute denial of there being any fraud, any injustice whatever, in the grant of patent rights; we think them, on the contrary, among the justest and fairest of all rights. "To grant to any *one* citizen an exclusive right to use that which belongs *equally to all*, would be unjust and iniquitous; but it is not so to *secure* to a man the exclusive privilege for a limited time to use the productions of *his own genius or reflection*. If a person is entitled to the products of his *manual labour*, why shall he be deprived of the avails of his *intellectual* exertions? They are both

equally his own, and he may use them in secret and destroy them when no longer wanted. If he imparts them to another, cannot he stipulate for a consideration, and a covenant not to disclose the secret to his disadvantage? And if, instead of disclosing it to an individual, the inventor makes his contract with *the public*, may he not do so upon the same conditions? There is, then, nothing unjust or iniquitous in securing to *the author* the exclusive privilege of using *his own invention* for a certain number of years, in consideration of its ever after becoming public property. This contract is equally advantageous to the individual and to the State: to the individual it secures for a limited time the products of his own exertions; and when, at the expiration of that period, the invention is cast into the common stock of property, to be freely used by all, the State is fully compensated for the protection she has granted."* But "all principles," says Junius Redivivus, "exist in nature," and every patent is only a "barefaced attempt" to monopolise one of those principles. We before observed, that our ingenious friend was entirely wrong in supposing that a patent could be taken out for a mere *principle*, or, at least, that there was any validity in such a patent; and we must respectfully submit to him, that it would be no more than proper to make himself acquainted with what the law is on the subject before he permits another edition of his work to go forth disfigured by so serious a mistake. "A manufacturer," he says, "is clearly entitled to the benefit of his labour." Exactly so; and therefore it is, and on no other ground, that the right of the inventor to the produce of his *mental* labour is insisted upon. A patent-right may not be the most "judicious" mode of securing that produce, or an equivalent for it; but that has nothing to do with the right itself, which remains the same. Junius Redivivus talks of the "mischievous tendency" of patent-rights. Has he duly considered how much mischief has been done—how much society has suffered—by the number of valuable inventions that have been utterly lost, from the want of such a sufficient protection to inventors as would have induced them to make a full revelation of their discoveries to the world? But "the Government," he adds, "takes no pains to ascertain whether a discovery is beneficial or mischievous to human beings, but instantly grants the patent-right, and pockets the large tax accruing in the shape of fees." Once more we must say, supposing all this to be true, what has it to do with the right of the inventor? However, it is *not* all true: Government does not, certainly, institute any preliminary inquiry to ascertain whether a discovery is beneficial or mischievous; but it requires that in every suit at law for a breach of a patent-right it shall be shown that the right is for something both new *and useful*. If the invention is not a useful one, and if especially it is of a "mischievous" tendency, the patent is void. Boards of Preliminary Inquiry have been often proposed, but no one has yet been able to obviate the many serious practical difficulties which oppose themselves to every scheme of the kind. To show Junius Redivivus that the granting of patents for inventions, which may afterwards turn out to be useless, is not only a necessary evil, but one which is common to the freest Republican States as well as to our own sadly misgoverned fatherland, we shall quote an observation or two on the subject by Dr. Jones, the Superintendent of the Patent-office at Washington:—"How could you contrive to make such a Board infallible? And if you cannot make it so, will you yet allow it to pronounce final decrees—to declare that the invention of one man is old, and that of another new? Before *this is done we must repeal our free constitution, and abrogate the right of trial by jury*." The British tax on patents is indeed "large"—in our minds, enormous, oppressive, iniquitous, abominable—but Junius Redivivus, to be consistent, ought to maintain that it is by no means *large enough*, since it is, according to his view of the matter, simply a tax or "barefaced" "fraud," "injustice," and resetting of stolen goods. We have no doubt that when Junius Redivivus examines the whole matter more thoroughly, he will be of opinion with us, that the less a man is taxed for bringing the produce of his inventive powers into the market, the better it will be both for the individual and his country, and the more consonant to every principle of justice and equity.

* Browne on Mechanical Jurisprudence.

RARE DISCOVERIES.—Mr. D. Thomas informs us, that he has "discovered the cause of universal gravitation," and wishes to deliver a lecture upon it, in order that he may, with the proceeds, exemplify another discovery, of nearly equal importance, which he has accomplished, namely, that a telescope can be so constructed as to "magnify a million times." We would recommend Mr. Thomas to try the Royal Society, but we refer him in preference to our friends in Southampton Buildings, as we perceive, from their advertisements, that they are sadly in want of something to give *eclat* to their establishment; having at present nothing more scientific or more suitable to mechanics to lecture upon, than the rules of heraldry and the genius of Lord Byron!

MISCELLANEOUS.

New Printing Machine.—We have been much gratified by seeing a small printing machine, on an entirely new principle, invented by Mr. J. Bogle, of Perth. In rapidity of action it is equal to Cowper's machine, and so easily worked that a boy may drive it with one hand. One person can work it, but more may be employed with equal facility, according to the hurry of the job. The machinery is constructed in such a way as to distribute the ink on the rollers, take in the sheet, print it, and deliver it at one and the same instant of time. It is perfectly at the command of the workmen, and keeps a record of the work it executes; so that the workman is saved even the trouble of counting his paper. This machine has not a single wheel about it; the contrivance for taking in and delivering the sheets is very ingenious—the only mystery being that such correct results are produced by so simple and apparently inadequate means. It prints every variety of work with the utmost facility; produces a clear and beautiful impression of a uniform colour, and altogether equal to any thing that can be done by any other press; prints correct register, requires no slip or blotting sheets, and in long numbers the impression is as clean in the last sheet as in the first. It also possesses the recommendation of working silently, and occupying less room than a common press, while it is much more cleanly. In a run of similar work, the forms can be adjusted on the machine in one minute, and in every case the types are as easily adjusted, and as readily got at in case of alterations, as on the common press. Although there is a great deal of brass and iron work in the construction of the machine, the inventor, who is a joiner, has executed every part of it himself,—a task, the difficulty of which can only be known to those who are aware of the correct machinery required in printing.—*Perth Advertiser.*

Canal of Gotha.—One of the greatest undertakings of Europe has just been completed, after a labour of twenty years—we mean the canal of Gotha, which traverses Sweden in all its breadth, from Gottenburg on the Cattegat to Soderkoping, on the Baltic. This great and useful work has been executed at an expense of 10,000,000 of rix dollars. In joining the two seas, the canal of Gotha opens to trade a far shorter and safer passage to the Baltic than that of the Sound, which obliges vessels to double the southern coast of Sweden. By the canal, on the other hand, the navigation is all inland, and therefore more commodious and secure. The duties too are much less than by the Sound; generally less than one-half. The trade to Russia and Northern Prussia may infallibly be expected to pursue this route, as soon as its advantages are known and appreciated.—*Times.*

Curling Stones.—The game of curling, which at one time was little known beyond the precincts of the eastern and southern counties of Scotland, has waxed greatly in public favour within the last dozen years, and is now practised at John o'Groats, in various parts of England, and over a large portion of the two Canadas. Channel-stones now form a regular article of export, and give constant employment to various artists in Ayrshire. Not a few of the stones are carved and ornamented, and bring very high prices.—*Dumfries Courier.*

The Inventor of the Steam Press.—The German papers announce the death of Frederick Kœnig, on the 17th ultimo, at Oberzell, near Wurtzburg. He was the inventor of the mechanical presses, upon an entirely new principle, which he, in conjunction with his friend Bauer, of Wirtemberg, first brought into use for the *Times* of London. The steam presses of the *Augsburg Gazette* were also constructed by them. For the last fourteen years they have had an extensive manufactory at Oberzell.—*Galignani's Messenger.*

Sir J. F. Herschel having terminated his series of calculations, on the subject of the double stars, is on the point of embarking for the Cape of Good Hope, with the intention of continuing his observations on these stars.—*Times*

INTERIM NOTICES.

A. B. will find Mr. Whytock's arithmetical system fully explained in the Mech. Mag. of Oct. 20th, 1832.

The author of the "Note Worth Notice" respecting Mr. Cresson and the Colony of Liberia, requests us to state that he has read the whole of the papers which we transmitted to him at Vindex's request, but that they do not *nullify*, in the smallest degree, any one of his statements; and, consequently, do not redeem Vindex's pledge, that Mr. Cresson should refute the "Note" the moment he was apprised of its publication. We, too, have perused these papers, and entirely agree with the author of the "Note" in the opinion he has formed of them. Mr. Cresson must grapple a little more closely with the statements in question, if he expects to make head against the unfavourable impression which they have produced on the British public.

Mr. Ride's letter, in reply to Mr. Robson, has been received, and shall appear in our next; as also an explanatory note from Audax.

Henry Pico.—We have made inquiry, and are informed that the manufacturer of the beautiful plaster models of the Parthenon, and other ancient buildings, is either dead or has left London. They are now difficult to procure.

"Charioteer" is mistaken. We are perfectly aware of all that Messrs. Ogle and Summers' carriage has *actually* accomplished; and though other persons may be deceived by the ridiculous representations which have been sent forth on the subject, we are not.

A. of St. Owen's-street—With pleasure.

Communications received from Friar Bacon—R. —A Carriage-maker—E. M. M.—F. F.—Long Pole. V. F. Hurtado—B.—J. O. N. R.—J. H. Arboleda.

ERRATA.—P. 280, col. 2, line 1, for "*a* C" read "A B."

—— —— l. 14, for "A and B" read "*a b*."

—— 282, col. 1, l. 21, for "inverted" read "uninverted."

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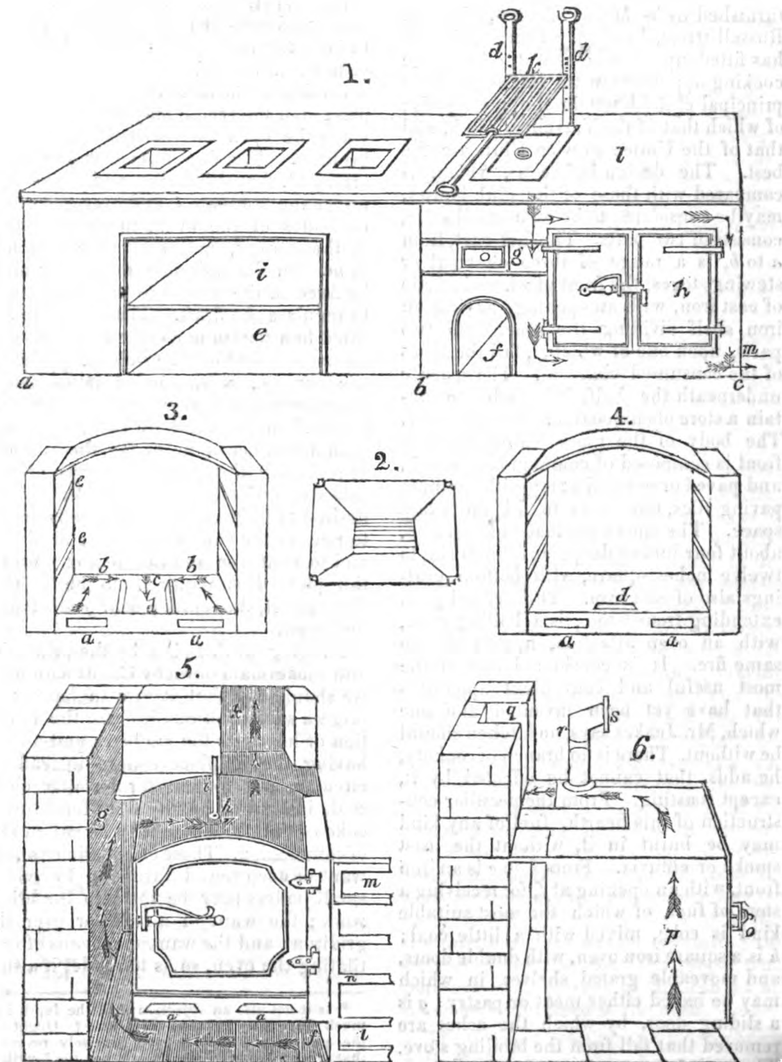
MODERN STEWING HEARTH, AND ROASTING OVEN.



MODERN STEWING HEARTH, AND ROASTING OVEN.

(From Mr. Loudon's Encyclopædia of Cottage, Farm, and Villa Architecture, Part IX.)

Stewing Hearth.

As an example of the present mode of fitting up stewing hearths in Britain, we may refer to the prefixed figure (1), engraved from a sketch which has been furnished us by Mr. W. Jeakes, of Great Russell-street, London. This gentleman has fitted up the whole of the extensive cooking apparatus in the kitchens of the principal club-houses in the metropolis; of which that of the Travellers' Club, and that of the United Service Club are the best. The design before us, which, as compared with those of the club-houses, may be considered to be on a small scale, consists of two parts. The first part, from *a* to *b*, is a range of three charcoal or stewing stoves, the front of which is made of cast iron, with an opening, having an iron shelf dividing the space into two parts, upon one of which, *i*, fall the ashes of the consumed charcoal. The space *e* underneath the shelf, is intended to contain a store of charcoal for immediate use. The body of the mass within the iron front is composed of common brick-work, and paved or covered at top with common paving tiles, cut so as to fill the exact space. The stoves are made of cast iron, about four inches deep, and from six to twelve inches square, with bottom gratings also of cast iron. The second part, extending from *b* to *c*, is a boiling stove, with an oven attached, heated by the same fire. It is considered one of the most useful and convenient apparatus that have yet been invented and one which, Mr. Jeakes says, no kitchen should be without. There is no branch of cookery, he adds, that cannot be effected by it, except roasting. From the peculiar construction of this hearth, fuel of any kind may be burnt in it, without the least smoke or effluvia. From *b* to *c* is an iron front, with an opening at *f*, for receiving a store of fuel, of which the most suitable kind is coke, mixed with a little coal; *h* is a square iron oven, with double doors, and moveable grated shelves, in which may be baked either meat or pastry; *g* is a sliding door, by which the ashes are removed that fall from the broiling stove. The top of the stove is made of cast iron, about an inch and a quarter thick, with three moveable plates fitting into each other, and forming a close cover over the fire. The pan or stove on which the fire is placed is in the form of fig. 2, and is made of cast iron, with a loose bottom grate, which may be renewed when required, without taking down any part of the frame-work. This stove is fixed immediately under the moveable plates or ovens, shown as if in one piece under the gridiron *k*. When stewing or boiling is to be performed instead of broiling, one or more of these plates is to be removed, according to the size of the boiler or stewpan; and the whole may be taken away when the open fire is required for the gridiron. The flue from this fire is so arranged, that the smoke and flame pass under the top plate *l*, and over and down the sides of the oven, in the direction of the arrows, and enter the chimney at *m*. In the chimney a damper must be fixed in the most convenient situation, to regulate the draft. The iron plate *l* is fitted to a pair of moveable standards *d d*, by means of which a gridiron, made for the purpose, is suspended immediately over the fire, and may be adjusted to any height, from the standards being furnished with a number of holes for the purpose of receiving the prolonged ends of the side styles of the gridiron. When it is desired to broil over the fire, it is usual to remove the two inner covers or plates, and to shut the sliding door *g*. When the plate *l* is required to be heated throughout, the sliding door *g* must also be closed.

Judging of this plan by the principles and models laid down by Count Rumford, we should say that it errs in having so large a surface of cast iron for the radiation of heat into the kitchen; and also in having the fireplace square instead of circular, and formed for burning charcoal, instead of having flues for burning coke or coal.* These may be called sins of commission. Those of omission are, the want of deep round furnaces, by which small boilers may be let into the brickwork; the want of a reflector over the gridiron; and the want of a means of ventilating the oven, so as to render it a sub-

* Is it not also an objection that the depth is so much less than the superficial area? Ought not the proportions to have been precisely reversed, that is, the depth greater than either the length or breadth.—Ed. M. M.

stitute for an open fire for roasting meat. The reflector or dome for the gridiron may be made in the form of a cone, of either copper or iron, and its use is to prevent the meat, while broiling, from cooling above while it is being cooked below. The ready answer of all ironmongers to such objections is, that brickwork is soon loosened and deranged by servants, and that economy of fuel is seldom an object with great families. As to a smoke-jack, the London ironmongers, so far from agreeing with Count Rumford, that it is a source of the greatest waste of fuel, affirm that it creates a draft in the chimney; which is about as correct as if it were asserted that a boat carried down a stream were the cause of that stream, or a windmill the cause cf the wind.* After all, this is only the operation of cause and effect, and the adjustment of means to ends; for if there is not a demand for a maximum of effect with a minimum of expense, what use would there be in producing it? It is sufficient for every tradesman to accommodate himself to his customers. Such is the language which we are obliged to hold, in a country were it requires the utmost exertions of health, intelligence, and industry to exist.

Roasting Oven.

An oven for roasting meat, so as to make it equal in flavour to that roasted before an open fire, was, we believe, first brought into notice in this country by Count Rumford, though this mode of roasting had been long before practised by the French. The art of roasting in an oven meat which shall have the same flavour as that roasted before an open fire, consists in producing a continual current of hot air around it. How this is to be done in an oven of sheet iron, heated by a furnace below, has been shown by Count Rumford, in the second part of his Tenth Essay, published in 1799; but the same thing was invented by, and used in the family of William Strutt, Esquire, of Derby, in 1797. Mr. Strutt's roaster has been used in his own family, in the families of his relations, and some of his friends, from that time to the present, for roasting meat of every description, and for general baking. We examined in 1810 a roasting oven, and very complete arrangements for cooking in ovens and close vessels, without any other open fire than a very small one, which had just been erected in the house of Mr. Joseph Strutt, at Derby, on Mr. William Strutt's principles; and, in common with most strangers that visit that town, we have seen the roaster in the Derbyshire General Infirmary. We have also seen one in Mr. Sylvester's house, in Great Russell-street, and others at several ironmongers in London, where they had been set up by way of experiment. Among these, we may particularly refer to Mr. Stevens, ironmonger, in Great Russell-street, who has long been in the habit of fitting up kitchens with all the improvements introduced by Mr. Strutt, and recommended by the late Mr. Sylvester, at one time a partner in the house, and by his son, an eminent domestic engineer. The construction of Mr. Strutt's roaster, and also of Count Rumford's, is such, that an equal degree of heat is communicated to the bottom and sides, and that a current of heated air is constantly passing through it. Roasting ovens of iron, however, belong more to ironmongery than architecture: we shall therefore not enter into details. Count Rumford's will be found minutely detailed in the Second Part of his Tenth Essay; and that of Mr. Strutt's in Mr. Sylvester's Philosophy of Domestic Economy, p. 33. The principle common to both is, placing an oven or box within a box, and the circulation of the heat from the fire equally in every part of the vacuity between the two boxes; and, secondly, the introduction of a tube between the two boxes, which shall heat a current of the external air, and introduce it into the inner box, at or near the bottom of one side, with another tube, having its orifice near the bottom on the opposite side, to carry it off. This tube, as well as the fire flue, has a register for regulating the current of heat, so that the proper temperature and current of air can at all times be maintained in the oven.

The union of roasting and baking ovens with kitchen ranges has been attempted, and with considerable success, by a great

* With all due deference to Mr. Loudon, the smoke-jack *does* contribute to increase the draft, and this in two ways; first, by contracting the throat of the chimney, and producing a similar effect to narrowing the stream of a river; and secondly, by prolonging, to the extent of that contraction, the influence of the fire on the ascending column of air, the velocity of which will always be in proportion to its temperature or levity. Of course, there may be chimneys so narrow, as to preclude all possibility of benefit from any such contraction.—Ed. M. M.

number of ironmongers, since the publication of Count Rumford's Essays. The first effort consisted in piercing one opening in the cast iron door of the oven near its bottom, for the introduction of fresh air, and another near its top for the exit of air, in order to promote circulation of air within. This was found to chill the meat, and prevent its being sufficiently roasted. These ovens had no double sides, bottoms, or tops, and, without very careful management, the meat could not be properly roasted in them. The fire was generally introduced underneath the oven, either from the open fireplace on one side, or by a small open furnace beneath; but this was found to overheat the oven on one place, and consequently to burn on one side whatever was roasted or baked in it. This defect led to the adoption of double bottoms, and double sides next the open fireplace, and in some cases to the introduction of the heating flue over the oven, or at the back of it, instead of under it. Ultimately, an approximation, by double sides, bottoms, and tops, to the ovens of Mr. Strutt and Count Rumford. We shall here describe one of those frequently used in connexion with the open fire of the kitchen range, protesting however against the open fire, as being much too large, and repeating an opinion, before expressed, that it ought to be dispensed with altogether, in every kitchen whatever on a large scale. The design for this roasting oven was furnished to us by Mr. Jeakes before mentioned.

Fig. 3 shows the inside of the oven or roaster, with the bottom removed; in which *a a* are openings for the admission of air, which circulates through the double bottom to the back of the oven at *b*, the two streams joining in one at *c*, and returning to the front of the oven at *d*; *e e* are grooves for two shelves, which ought always to be open work, in order not to impede the circulation of air. Fig. 4 shows the inside of the roaster, with the bottom put on, in which *a a* represents the holes for the admission of air to be heated, and *d* the opening for the ascent of the air when heated, in order that it may circulate in the roaster. Fig. 5 is a front view of the oven, with the door put on, but with the front casing and top of the flue round it removed. The smoke enters from the open range at *f*, and proceeds to *g* and *h*, where there is a partition, *i*, which forces the smoke to come from the back to the front, where it ascends the upright flue *k*; *l* and *m* are the bottom and two top bars of the range, which are rivetted into the style, to allow of their contraction and expansion. The openings *a a* in this figure, are shown with projecting caps, to prevent dust from getting into them; which caps may be prolonged downwards, so as to act as a sort of blower. Fig 6 is a transverse view of the roaster, with the outer casing removed, in which are shown the end of the latch of the door of the oven *o*, the direction of the smoke up the side and under the top of the roaster *p*, the upright flue *q*, and a cast iron tube *r*, at the back of the top of the roaster, the lower end of which projects down to within six inches of the bottom, for the purpose of carrying off the air which has been circulated among the articles cooking, and the upper end may be carried as high as the chimney bar or lintel will admit. This tube terminates in a register at *s*, by which the circulation of air in the oven is accelerated or diminished.

We have introduced this range roaster to show architects, who have not made themselves acquainted with roasting in ovens, what sort of kitchen ranges they ought to recommend. For want of this knowledge we continually see inns fitted up with ranges and large ovens, entirely without a system of ventilation, by heated air, and which are therefore comparatively useless, or at all events unprofitable, to their owners. Such is the ignorance of the public, and the impudence of some ironmongers, on this subject, that in the first week of the present year (1833) a large furnishing ironmonger in Holborn advertised what he called "the best range in London," for country inns, &c. On calling to see this range, we found it nothing more than a common one of a large size, with a brass register in the oven door, for admitting cold air *direct to the articles baking*, but with no system of ventilation. The seller, as a recommendation, declared it to be constructed on Count Rumford's principles, *with the latest improvements!*

MR. HALL'S IMPROVEMENTS IN STEAM-ENGINES.

Vauxhall Works, Leicester,
Jan. 26, 1833.

Sir,—I propose, for the sake of your readers, and the utility and advantage of your Magazine, to discuss the different

parts of Mr. T. V. Robson's critique upon Mr. Hall's inventions.

As far as relates to the piston, Mr. Robson considers it complex. In a drawing the representation of two or three screws no doubt looks complex to an inexperienced eye; but is there, in point of fact, any difficulty in making and fixing them? The cover and bottom are cast so as to fit into the middle block. Where, then, I would ask every practical mechanic, is the complexity of this piston or the difficulty of constructing it? The same argument holds equally good with the valve; and surely the packing may be pressed by the adjusting-screws as well when the engine is at rest as when in motion. In what, then, consists the objection of not being able to adjust the valve-packing when at work? Mr. Robson, speaking of the valve, says, "when by the patentee's own showing the surfaces are rendered *untrue by the application of heat*." He appears from this to suppose that Mr. Hall is alluding to his patent valves, whereas he is speaking of "slide valves of the common construction" with "large working surfaces."

Perhaps I ought to apologise for making any remarks upon that part of Mr. T. V. Robson's letter addressed to Audax, but to make my answer complete I cannot avoid it. He says that Audax, instead of defending the pistons on the score of utility, does confidently "assert that he finds no complexity at all in making them." But with what truth can Mr. Robson make this assertion when Audax says, in speaking of the piston and valve, "I can vouch for their action (which is the main point) being beautifully simple and efficacious?"

After dismissing the subject of the piston and valve, Mr. Robson asks, what he appears to consider a very pertinent, nay, an unanswerable question. "I, therefore, now wish to ask whether so plentiful an injection of the lubricating matter is not necessarily attended with a considerable degree of condensation?" Supposing the quantity of oil injected into the cylinder to be a pint per minute—which, no doubt, is an ample quantity for lubricating a 10-horse engine—and supposing the engine to make 40 strokes a minute, you will then have an 80th part of a pint of oil injected every time the cylinder is filled with steam. What quantity of steam would be condensed by such 1-80th part of a pint of oil, I leave to the investigation of the sagacious Mr. T. V. Robson, and should feel particularly obliged by his informing us, when he next writes, what is the result of his calculations.

Speaking of the pipes being in the first instance filled with cold water, Mr. Robson goes on to ask, "Now, Sir, how was I to understand what was never before hinted at?" I hope, after this, neither Mr. J. O. N. Rutter,* nor any other person, will consider Mrs. Glasse guilty of surplusage in desiring her readers first to "catch a hare." Certainly, I should no more think of telling a cook first to catch a hare, than I should think of telling an engineer before he begins his *cookery* first to fill his boiler, his condensing cistern, aye, and even his refrigerating pipes, with cold water. I will, however, for Mr. Robson's information, state, that if he begin to work the engine with the pipes empty, it is no crime, as they will shortly be filled with water resulting from the condensation of the steam. Alluding to the working of the air-pump producing a vacuum at the ends of the pipes, Mr. Robson seems really not to perceive that it means that in the *chamber* at the ends of the pipes, and not in the pipes themselves, a vacuum is produced by the air-pump, which is attached (as shown by the drawings) to that chamber. The vacuum cannot be in *the pipes*, for, notwithstanding Mr. Robson's assertion to the contrary, they are full of water; and I assert, without fear of contradiction from this gentleman *of the profession*, that the steam is converted *instanter* into water, the moment it enters them by the apertures at the tops of the caps within the chamber adjoining the working cylinder, while the water escapes through the holes in the caps on the other ends of the pipes, and that only as fast as the water is produced by the condensation of the steam at the other ends—for the pipes being full, they can hold no more. I am ashamed of being so minute, but I wish, *if possible*, to make even Mr. Robson understand me. The vacuum in the chamber adjoining the working cylinder supports a column of 28 inches of mercury, measuring from the surface, and not (as is the practice with many engineers) from the bottom of the body of mercury; and the vacuum in the chamber at the other end of the pipes, to which the air-pump is attached, is somewhat more perfect, as it will support a column of $28\frac{1}{4}$ inches of mercury. I have measured the columns of mercury myself, and so have many other engineers; therefore, I consider this important point to be set at rest. With respect to starting the engine, the chamber at the end of the cylinder, or the cylinder itself, must have steam blown through it, and the engine starts with as much facility as any common condensing-engine.

* See the page in the Mech. Mag. opposite to that containing Mr. Robson's letter, viz. p. 270.

Mr. Robson next observes, "I should have imagined that when the air-pump had removed, as he (Audax) says, a portion of the water contained in these pipes, the vacuum so caused would neither be at one end nor the other, but, from the position of the pipes, that the natural gravity of the water must find its level, when there would be a clear passage from end to end of the pipes, only reduced, of course, in the sectional area by the water confined therein by caps." Now, in all this there is nothing but what is merely imaginary—not one iota of the whole being based in fact. What nonsense to talk of the natural gravity of the water, and the sectional area of the pipes, being *reduced* by the water confined therein, when such pipes are absolutely filled with water!

The most extraordinary passage in Mr. Robson's letter, and I suppose he considers it highly scientific, is the following:—"Truly may it be said, that a drowning man will catch at straws; for all that can be gathered from this new reading is, that that for which one minute is too short, may be very effectually accomplished in thirty hours! But what have we to do with the heat or caloric contained in a given quantity of steam, any more than merely to abstract so much of it as will reconvert it into water." What Mr. Robson means by the latter sentence I leave to others to conjecture, for it is past my comprehension to see how he means it to apply against Mr. Hall's invention. Does he not abstract the caloric or heat, and that without injection? How is it that Mr. Robson does not see that although the transmission of the caloric contained in steam will not take place through metallic surfaces in one minute, it will be amply effected in thirty hours? And how is it that he cannot perceive that all this is effected by Mr. Hall's invention? If Mr. Robson cannot understand the lucid explanations of the patentee, it would be worse than useless in me to lose my time in any further discussion of a subject which, being matter of fact, is incontrovertible. Perhaps Mr. Robson thinks that abstracting as much caloric from the steam as will reduce the water resulting therefrom to 212° of temperature is sufficient; and so it would be if the steam were subject to the pressure of the atmosphere; but in a vacuum the temperature of the water resulting from condensed steam will be only 88°, or, in other words, water in a vacuum will boil at 88° of temperature. Possibly it may be Mr. Robson's ignorance of this fact that has caused all his extraordinary blundering. Mr. Robson even does not perceive the advantage of supplying boilers with distilled water; nor does he consider it as any invention. He does not see that the water of condensation in common engines is a mixture of about 98 per cent. of injection water, which may be saline or otherwise impure, and only about 2 per cent. of distilled water. Of course, the boilers are supplied with that mixture; whereas the *whole* of the water supplied by Mr. Hall's plan is distilled, and, consequently, perfectly pure. Is this, as Mr. Robson says, only "*somewhat* purer water" than the above mixture of 98 per cent. of dirty water (and none other but dirty water can, in nineteen cases out of twenty, be procured)? Does he consider of no consequence a deposition of earthy or saline matters in boilers, which often forms a hard incrustation therein, whereby the transmission of the heat from the fire to the water is retarded, and the destruction of the boiler is accelerated?

After Mr. Robson has castigated Audax, let us see how unmerciful he is to your humble servant. He thinks he has so cleverly answered that correspondent, that he needs take but little trouble with me. He says, "I am unacquainted with any rule by which to discriminate between pieces of quackery and inventions of real worth." Truly, I believe Mr. Robson; for I am convinced he has not the rule (which can only be composed of abilities and knowledge) to discriminate and understand what is good and what is bad, what is true and what is false, or what is in accordance with the laws of nature and what is in opposition to them. I am constantly put in mind of my old friend, Hudibras, for it may also be said of what Mr. Robson states,

> "It either may be said or sung,
> No matter whether right or wrong."

He proceeds by saying, that "Mr. Hall's piston and valve, if they are at all dependant on any lubrication to make them steam-tight, can neither be scientific nor correct in their construction." A second Daniel come to judgment! Then, by parity of reasoning, we must conclude that the most beautifully manufactured watch or chronometer can neither be "scientific nor correct," because it requires the application of a little oil to lubricate it! Let us go on, however: we shall get to the bottom of Mr. T. V. Robson's wonderful science by-and-bye. Well might Job exclaim, "Oh! that mine adversary had written a book." Mr. Robson proceeds:—"Nor can I, I do assure him, see any amazing loss of power consequent on pumping out the injection water. I really think it would put him to a nonplus to inform us correctly what extra power is re-

quired to work the air-pump, solely on account of the injection water."

I really begin to pity Mr. Robson, and feel that I am breaking a poor fly on the wheel. Perhaps it is excess of modesty which makes him say that *he* cannot see the *loss* of power by pumping out the injection water; however, I promise him it will not put me to a nonplus to calculate that which seems so to puzzle *one of the profession*. I will now state the question, and though I think it may amuse some of your very juvenile readers, it certainly will not put them "to a nonplus." Suppose seven gallons of water per horse-power per minute be injected into an engine, and suppose it has to be pumped out of a vacuum that will support a column of 28 inches of mercury, which we will consider to be, in round numbers, equal to a column of 33 feet of water: the question, then, to solve, is simply how much power is required to pump seven gallons of water per minute 33 feet high? With respect to the *actual* amount of the saving of fuel, *that* can be ascertained by comparison only where machinery of uncertain power is worked by an engine. I have no hesitation in saying that it is very great, and beg to refer the readers of the Mechanics' Magazine (current volume, p. 90,) for the comparative statement of the consumption of fuel, ascertained by trials made by Mr. Hall's servants.

I have had so much of Mr. Robson's nonsense to notice, that I have no doubt both your readers and yourself must be tired. I must, however, before I conclude, advert to the two following extraordinary assertions:—"But I much wish he had informed us how he could make a condenser of what he is pleased to term the substratum of all the inventions, and which is described as a series of pipes, kept always full of water, into which the steam is forbid by the patentee to enter until it is first condensed? I repeat, that as a condensing apparatus they can be of no earthly use." He says the patentee forbids the steam to enter the pipes until it is first condensed. How now, Mr. Robson? Pray has it not been always stated as clearly as possible that the steam is condensed *instanter* on its entering into the pipes, and not *before?*

I trust that, after the statements I have made of facts which I have witnessed, and to the truth of which I pledge myself, it will not be thought necessary that I should say another word in answer to Mr. Robson's last preposterous and obstinately repeated assertion, that the refrigerating pipes "can be of no earthly use." I give Mr. Robson credit for the witticism with which he concludes his epistle, for it really is the only good point he has made throughout the whole.

Nothing but the importance of the subject under discussion can excuse the length of this letter.

I remain, Sir,

Your very obedient servant,

JOSEPH RIDE.

Sir,—I beg, in reference to the "Interim Notice" addressed to me in your Journal of the 26th inst., to say, that if you will refer again to my letter of the 10th of December, I think you will find that I exposed Mr. T. V. Robson's exaggerated statement respecting the complexity of Mr. Hall's patent piston and the trouble of making them; showing, that he had multiplied the difficulties much in the same way as our valiant friend, Sir John Falstaff, did the number of his enemies in buckram suits.*

As this matter ought to be explained, in order that Mr. Robson's statements may not be left unanswered, and, of course, appear to be admitted, allow me to quote and reply to the following lines from his letter, p. 156:—

"The first improvement on Mr. Hall's list is, without doubt, complicated beyond all precedent, as may be seen by inspecting the sections A and B, each showing but one-sixth of the work in every individual piston."

Taken literally, this certainly would imply that there were required to every piston six piston-rods, twelve screws and nuts to suspend the bottom from the middle block, twelve others to attach the cover, and all other things in proportion. If Mr. Robson has written in this loose and extravagant way to catch the eye and blind the judgment, I think, Sir, you will agree with me that, in justice to the patentee, he ought to be exposed; and I therefore trust to your candour to publish this letter. I beg distinctly to repeat, that I find no complexity whatever in making Mr. Hall's pistons; nor has this any thing to do, as Mr. Robson handsomely insinuates, with my getting paid for them.

I remain, Sir, yours respectfully,

AUDAX.

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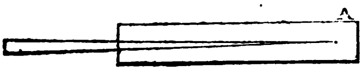
* The manuscript of the letter is not now in existence, to refer to; but we recollect perfectly the simile of Falstaff and his men in buckram, and also that it was owing to some unintelligibility in the manner of applying it, that we thought it best to omit it.—ED. M. M.

ELECTRICAL EXPERIMENTS.

1. *To take a spark with a point.*

Many electricians with whom I have conversed had never seen a spark taken from the machine by a point. It is a very old experiment. I confess, however, although, as I suppose, I must have often read a description of it, I had never attempted it, nor indeed considered it possible, until some months ago a gentleman called on me to see my machine, and he politely taught me how to produce this apparently anomalous effect.

It is done by introducing a point into a glass tube, about four inches long, thus:—

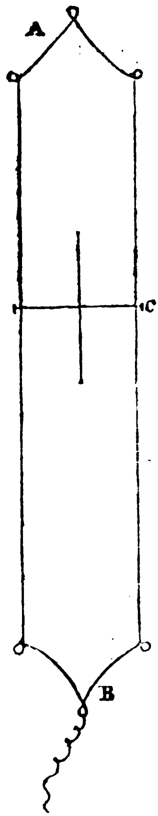


On presenting the end A of the tube to the conductor, sparks of intense brilliancy pass from it to the point. Of course the point must be metallic, and in contact with the hand of the operator.

During the last week, I have adopted a still more simple process for accomplishing the same object. By interposing a card, or a piece of writing paper, between the conductor and a fine pointed instrument, sparks may be taken as with the tube. I have used the finest sewing-needle that can be procured for this purpose. If the interposed substance be withdrawn, the electricity passes from the conductor to the point silently. In both cases, let it be observed, neither the tube nor the paper must be in contact with the conductor. These experiments are trifling in themselves; but they tend, I think, forcibly to impress upon the mind some of the conditions that are necessary for the exhibition of electrical phenomena.

2. *Inclined Plane.*

The apparatus for this experiment is usually expensive. I use the following, which is very cheap, easily constructed, and answers every purpose. A whirl being first obtained, whose diameter should be proportionate to the power of the machine, a plane for exhibiting its operation may thus be formed:—Procure about seven feet of stout copper wire, (that which I have is No. 10.) straighten it, and cut off two equal lengths of 2½ feet. Divide the remaining 2 feet equally. Here will be two sides and two ends for an inclined plane, and when hooked into each other, they will present the following appearance:—



A is attached to the conductor B, held in the hand of the operator by a piece of silk cord, which insulates the apparatus. By raising or depressing the end B, the whirl C might be made to revolve with greater or less speed, as may be required.

J. O. N. RUTTER.

Lymington, January 29, 1833.

CANAL NAVIGATION. — MR. GRAHAME'S LETTER.

Sir,—A number of your valuable Magazine having been published without an answer to the letter in your number of

the 26th ult., signed " A Young Subscriber," I trust I shall not be deemed presumptuous in replying, as far as in me lies, to that letter.

In the first place, I think your correspondent is mistaken when he asserts that " the opponents of railways are very fond of referring, in support of their views, to the results of certain *experiments* made upon the Ardrossan Canal in the years 1830 and 1831;" although he admits that, " at first sight, they appear to carry with them great weight." The opponents of railway monopolies do not depend upon a first sight, however, inasmuch as " a speed of ten miles an hour has for nearly three years past been maintained in the carriage of passengers on one of the narrowest canals in Britain, without raising a ripple on the banks, even when the vessel carried upwards of one hundred passengers." But " the case" has undergone " a little more sifting," and it has been proved that the results do not " depend entirely upon the local peculiarities of the canal in question." A series of experiments has lately been made at the " National Gallery of Useful Science," in Adelaide-street, Strand, which, I have been given to understand, goes to confirm most satisfactorily the statements made respecting the Ardrossan or Paisley Canal; and I believe the matter will not rest there, as it has been suggested that the experiments should be shown in the neighbourhood of London, with boats on a large scale, and some progress has been made in arrangements for that purpose. The only peculiarities of the canal in question are, that it is " the narrowest, shallowest, and most curved canal in Scotland;" which peculiarities, I presume, cannot be considered so advantageous as to entitle it to any particular exception in its favour.

The distance from Glasgow to Johnstone is twelve miles; the average time consumed in the passage is one hour and twenty-eight minutes, including a stoppage of twelve minutes at Paisley, which place furnishes the greater number of the passengers. There are not any locks or *sluices* on the Ardrossan Canal, but " in two of the stages it is for a considerable distance so narrow that two boats cannot pass; at these places, when the boat is fully loaded, the speed is slackened to between four and five miles an hour, and the time is afterwards made up in the wider parts of the canal; the entire length of these narrow places extends to fully a twelfth of the whole length of the canal." I cannot say what is the annual tonnage passing along the canal; nor can I say how often the slowly travelling boats impede the progress of the fast boats; but Mr. Grahame, from whom I have my information, and whose letter on the subject I send you, states that he has " performed a voyage of fifty-six miles along two (other) canals, including the descent of four, and the ascent of eleven locks, the passage of eighteen draw-bridges, where the line was thrown off, and sixty common bridges, and a tunnel half a mile long, in six hours thirty-eight minutes; the boat carrying thirty-three passengers, with their luggage and attendants." The price of the horses is stated to be from £50 to £60 per pair; but I believe they have not been long enough running to ascertain their duration.

It is to be hoped that the results of the late experiments will soon be published, and also that the experiments on a large scale which have been contemplated may soon be made; when I have no doubt that your correspondent, and all others who seek only truth, will be fully convinced of the soundness and importance of this discovery, as it may be called.

I am, Sir, your obedient servant,

B.

London, February 7, 1833.

The letter of Mr. Grahame, which our correspondent has so obligingly forwarded to us, is addressed to " The Canal Proprietors and Traders on the line of the projected London and Birmingham Railway." It is a very clever, but at the same time a very uncandid production, and written in so manifest a spirit of *canal* partizanship, that it would be unsafe to place much reliance upon it.

Mr. Grahame's purpose is to show that no railway coaching trade could possibly stand a competition with canal passage boats, navigated in the manner of those on the Ardrossan Canal, and that the superior advantages which are popularly ascribed to railway conveyance are entirely visionary. He brings forward a number of statements and calculations to prove that persons may be conveyed by canal passage boats, fitted up in the best style, at the rate of *ten* miles an hour,

at an average cost of three-halfpence per mile; while the fare in the first class coaches, on the Liverpool and Manchester railway, which generally accomplish the distance of *thirty* miles in an hour and a half, is three-pence per mile; that is, exactly double. Now, supposing the difference to be as here stated, does it therefore follow that canals are, on the whole, superior to railways? Manifestly not. The expense of travelling on railways may be double that on canals; but if you have in return for this double expense, twice, nay thrice, the speed, are you not amply compensated? Travellers who post with four horses, do not expect to get so cheaply off as those who travel with two.

The facts adduced by Mr. Grahame show, at the most, this only—that where a speed of ten miles an hour is all that is wanted, you can accomplish that speed on a canal at less expense than in any other way; but that if you wish to go at any greater speed, *you cannot obtain it by this means at all.*

The comparative cost of railways and canals is, however, by no means fairly stated by Mr. Grahame. He omits to tell us what dividend the three halfpence per mile, enables the Ardrossan Canal Company to pay on their stock,—whether three, five, or ten per cent. Now, if it should happen that the Ardrossan Canal proprietors receive only four or five per cent. on their shares, while, as all the world knows, the proprietors of the Liverpool and Manchester Railway have been dividing eight and nine, it will follow that the railway proprietors might reduce their rates nearly one-half, and yet draw as large a revenue as the canal gentlemen; that is, they could convey passengers by the railway nearly as cheap as on the canal, at *three times the speed.* We do not know how the fact really stands; but as we have never heard the Ardrossan Canal spoken of for its high dividends, we make no doubt that a very large reduction must be made on this score, from the superiority claimed for canal conveyance.

Again, Mr. Grahame is fond of describing the Liverpool and Manchester Railway, as the " best finished," the " finest line of railway in Great Britain;" meaning thereby to convey a strong impression of his fairness, in selecting it for the groundwork of his comparison. Now to say that it is the " best finished," and " the finest," is to say but little, since there was, in fact, but one other railway for general traffic at the time he wrote—namely, the Stockton and Darlington. Besides, though perhaps the " best finished," and " the finest," it is not in absolute terms, either a " well finished," or a " fine railway," but very much the contrary. Mr. Grahame says, it is " without a single curve from end to end, and with only two short ascents;" whereas, the truth is, it has a great many curves, and consists altogether of ascents, with the exception of three levels, the total length of which is only six miles. Had the railway been as level as Mr. Grahame represents it to be, and as it might very probably have been made, the labour and cost of conveying goods and passengers by it would not have been half what they now are. That the line is so uneven as it is, and some of the ascents so steep, was owing perhaps less to bad engineering, than to the local interests and prejudices against which the company had to contend; they were probably obliged to adopt, not the best line which the nature of the country offered, but that which, under all circumstances, seemed to promise the least chance of opposition in Parliament.

Mr. Grahame exhibits a similar unfairness in regard to the carriages by which the traffic on this very faulty railway has been hitherto carried on. He is careful to remind his readers that the scheme of navigating canals, at a quick rate, " is still in its infancy;" but he wholly forgets to notice the large allowance which must be made for railway travelling for the same reason. He makes no doubt that great improvements will yet be made in the gig-shaped boats,—improvements by which either the cost will be greatly reduced, or the speed much increased; but he does not seem to consider it as even an imaginable case that the railway steam carriages should ever be made better than they now are! So much for being an out-and-out partisan!

We suspect that, as usual, the truth will be found to lie between the two extremes. We have little doubt, that by the adoption of the gig-boat system of navigation, the conveyance by the existing canals might, in many parts of the country, be so improved in point of celerity, as to leave no adequate inducement for the introduction of railways; but we

have just as little doubt that wherever speed is a primary consideration—as between large manufacturing towns and principal seaports, such as Manchester and Liverpool, Birmingham and London—and wherever the question lies between forming a canal or a railway, on a line where neither canal nor railway existed before, the preference will and ought to be given to railways.—Ed. M. M.

CARRIAGES AND CARRIAGE-BUILDERS.

Sir,—In Number 494 of your valuable Magazine, I find a second letter from Junius Redivivus, on the subject of carriages and carriage-builders, and I trust you will favour me with an opportunity of correcting the erroneous notions which that letter is, in my opinion, calculated to diffuse.

Junius recommends to me, as an improvement, to use gunnel iron (a kind of corner plate it appears) to secure the bottom sides of my landaus, instead of the usual flat ones, with the view of obtaining perfect rigidity. I am obliged to him for his good intentions; but I am decidedly of opinion that his plan, however ingenious in theory, is totally inapplicable to practice. It must be borne in mind, that the bottom of a landau is not a regular curve, but an arbitrary one, depending upon the fancy of the builder; and being also of different sizes, it follows, that the flat plate to lay on the bottom side, must be wrought to each particular shape, and the edge-plate welded on to it; the skill and labour requisite to fit this to the body would be very great, and the expense consequently increased. Besides, it is not desirable that a landau should be made so unalterable, as one thus constructed would be; because, in addition to the tendency of the doors to nip, we have occasionally to make alterations, in consequence of the contraction or wear of the leather of the upper part (the head), and sometimes, no doubt, on account of difference of temperature affecting the metal itself—all which we are now able to accomplish without difficulty. In fact, all that can be accomplished by Junius's plan has been done many years ago, by simply making what is called a solid rocker; that is, instead of the inch elm board, generally used, a strong piece of ash of the same depth, and three or four inches thick, is bolted on to the bottom sides, and only an iron top plate is used, thus gaining equal lightness and strength to what Junius proposes, and that in a very economical manner, and yet retaining the advantage of being able to adjust the body. It is, however, little used, as the appearance is heavier than when the double plates are employed; and in this, like other instances, we give apparent lightness by adding real weight.

On the subject of springs, Junius and myself seem to be of the same opinion still; but with respect to the carriages built with elliptical springs, called "Elliot's Patent," which a few years ago had their day, where are they now? The truth is, the merit of this kind of springs consists in their allowing of a more simple and economical construction of carriage than any other, as they form the connexion between that and the body; but when it is remembered that they consist of two curves of steel, joined at their ends, the fixtures being at the centre or highest part of the curve (the top of the arch we may call it), and the weight pressing also on those points, it will, I think, be obvious to every mechanic, that their construction is imperfect, because the upper and lower parts of the spring counteract each other, and occasion a trembling, jerking kind of motion. Let Junius, by way of experiment, get into an omnibus thus built, and when on the stones, and especially if it contain but few passengers, he will discover that every time it gets into a hole he will be jerked up and down, in a manner that will remind him of the juvenile game of cup and ball. But, lest it should be objected that this is not a fair trial, if he has a medical friend who possesses one of those useful but somewhat despised vehicles, called by the French a demi-fortune, and by John Bull a pill-box, in fact a one-horse chariot, (in building which, these springs are used with advantage, lightness being the main object,) let him take an airing in it, and I think he will be convinced he is in error. I would advise him, however, as a matter of economy, to leave his Sunday-going hat at home, as it is by no means unlikely, being unused to the motion, that an extra jolt may demolish the crown of his beaver.

As applicable to steam carriages, springs, I apprehend, must be considered with reference to the support or suspen-

sion of the body only, for as long as a crank, or any inflexible communicator of the power to the wheels is used, it is clear (to me at least) that no springs whatever can be applied to the frame-work and propelling apparatus, which will in fact bear the same relation to the body that the carriage, as it is technically called, does to ordinary vehicles, the carriage part being mostly devoid of springs, further than it supports those upon which the body is hung (under and elliptical springs of course excepted). On this point Junius has misunderstood me, as he will see on reference to my letter.

A working steam carriage yet remains to be produced, and until then it is impossible to do more than conjecture how the labours of the engineer and coachmaker may be best combined; but it may be fairly anticipated, that at first the horizontal springs, as used so generally for stage coaches, will be employed, when it is intended to have the engine and passengers on the same set of wheels. Elliptical springs are perhaps more objectionable for steamers than any other, and whether C springs can be used, depends upon the engineer, not upon the coachmaker. In these observations, I beg to be understood as looking forward to the completion of a carriage which shall have its machinery sufficiently low to admit of the body being placed above it, the engine part having no springs at all.

And here it is but fair I should make the *amende honorable* to Junius, for the hasty manner in which I spoke of his wheel. Cn consideration, the principle of applying a spring within the wheel appears to me the only one which can be applied to the machinery part of steam carriages, so as to relieve a heavy carriage from the jars it will meet with on rough roads, when going at a rapid pace; and although the probable weight is somewhat objectionable, yet that objection diminishes when I recollect that the iron wheels made by Theodore Jones are daily becoming more common, and therefore may be presumed to answer. The spring wheels will, I think, also add somewhat to the draught; but I hope the idea will meet with attention from those more immediately occupied in bringing steam carriages to perfection—a consummation devoutly to be wished, and the acceleration of which, in ever so small a degree, is an object well-worthy of the purest ambition.

Junius is witty upon that perversion of words which sometimes I am obliged to hear; but his profound learning in the slang of the stable is beyond all praise, and when there is a professor wanted, I hope his pretensions to the chair will not be passed over. My habits of life necessarily bring me in contact with many of the "rum uns" Junius alludes to, but I really see no occasion to use these barbarisms, or the shibboleth of the workshop, when phrases more generally understood will answer the purpose. And with regard to his charge of our being a money-getting class of men, that need not be made against coachmakers in particular; it is *national*, and calls for no especial defence from me. Considering, however, that the poet and the patriot, the painter and the actor, and, in fact, all who are eminent in any particular pursuit, while they love that pursuit are not unmindful of the gains it procures—while Mammon is the god of English idolatry—it is really too invidious and splenetic to apply a reproach to one particular body of men, who are no worse than their neighbours.

To conclude, I will ask Junius, when he says that if coachmasters study the principles of science it will render expensive experiments rare, how it is that expensive experiments are at this day going on to bring a steam-carriage to perfection? With the science and talent of some of the parties engaged, one might have reasonably expected to see one spring forth, fully armed for the fight with the old roadsters, as Minerva sprung from the brain of Jupiter.

I am, Sir, your obedient servant,

PHÆTON.

To Junius Redivivus.

Sir,—In your answer to Phæton you find great fault with the motion of the C springs, and give a preference to the double elliptic spring. Now, I think if you were to ride in a carriage made by a good workman, and hung on four well-made C springs, your opinion would be changed. The motion of the C springs is neither jolting nor irregular, but up and down, and very easy. With the elliptic springs, on the contrary, there is one continued jolt and jump; if one wheel gets into a hole, there is a sudden pitch on

that point, and the effect is felt by the person inside; while with the C spring the effect is not felt at all.

With respect to landaus, I think your study of coachmaking must have been rather limited, or you would have known that edge-plates are applied by many makers to landaus and landaulets, some bolting them on the outside of the rocker, others on the inside.

With respect to improvements in carriages, I think you have shown in your letter that many have been made, and no doubt there would be more were it not that, in consequence of the taste of the public running so much after novelty in these matters, the attention of carriage-makers is more directed to the invention of new sorts of carriages than to improving the old. For instance, the stanhope for a time drove the tilbury out of the field, and now the cab-phæton bids fair to supersede most other kinds of phæton.

I am, Sir, your obedient servant,

A CARRIAGE-MAKER.

HICKS' GAS ROASTING APPARATUS.

Sir,—I am greatly pleased with the gas roaster, invented by Mr. Hicks, and described at page 297. One important piece of information is, however, omitted, but you are not to blame for that,—I allude to the price of the apparatus. There is one part of the arrangement that I think will admit of improvement; viz., the imperfect combustion of the gas. I confess myself so dull as not to be able to comprehend why the inventor prefers burning only a blue flame. Economy, certainly, at first sight, appears to justify it; but I very much doubt whether it be the most economical mode. I have just concluded some experiments on the relative heating properties of gas, when consumed imperfectly (with a blue flame), and when at a slight degree above that temperature, it enters more completely into combustion, and becomes incandescent. I fixed the naked bulb of a chemical thermometer about four inches above an 18-hole gas-burner, in which only sufficient gas was consumed to support a blue flame: the maximum elevation of temperature, under these circumstances, was 422°. I then turned on just enough gas to produce a film of light above the blue flame,—the mercury in the thermometer started, in a few seconds, to the top of the tube, 660°. I have not sufficient leisure now to enter more fully into the subject. I offer the above hint because it appears to me important to set out in a matter of this kind with our eyes open to all the advantages as well as all the difficulties. If by consuming a few feet more gas the process can be perfected in less time, a saving will evidently be effected. Time, to many, is of more value than money.

I have another objection to the blue flame: if the gas be impure, its imperfect combustion will tend to impart an offensive odour to the meat; this would be, in a great degree, obviated by employing a higher temperature. The ingress of air should also, I think, be subject to control.

If, as I have shown, gas in a state of incandescence yields so much more heat than when consumed at a lower temperature, may we not also calculate on some additional advantage through the agency of radiation?

A highly respectable periodical (the Athenæum), in speaking of Mr. Hicks' ingenious apparatus, observes, "Much, however, remains to be done, before the invention can be made serviceable; there are numberless uses for a kitchen fire besides roasting, and few families will be inclined to admit *the most horrible of all nuisances, a gas-pipe*, into their house, on the mere chance of an occasional service in this way." To the words in italics I object. It may be a matter of taste whether gas shall be admitted to a house, either for lighting or cooking, but that the admission of gas constitutes of necessity the most horrible of all nuisances, I most unequivocally deny. The charge is as unfair as it is unjust.

On my own premises I have upwards of 300 feet of "gas-pipe," which supplies, in different situations, 11 burners; but I have never found the gas a nuisance; on the contrary, it contributes essentially to comfort, convenience, and economy. If the "gas-pipe," or other fittings, be defective, or insecurely adapted, or if the gas be very impure, then I allow there may be sufficient cause for complaint. These, however, are accidental conditions, and in no respect necessary to the employment of gas. The gas, by whose light I am now writing, will not stain the most delicate test that

the chemist can devise; and throughout the whole length of tubing there is not the slightest escape discoverable.

I am, Sir,
J. O. N. Rutter.

Lymington, Feb. 6, 1833.

PRACTICAL HINTS ON MECHANICAL DRAWING.

[The following sensible letter was originally addressed to a private friend, who conceiving that "the hints contained in it may be of some use to others, as they have been of much to him," has, with the writer's consent, forwarded it to us for publication. Mr. Jarvis, though unknown by that name to our readers, is no stranger to our pages, to which he has anonymously communicated many valuable papers.—Ed. M. M.]

Dear Sir,—The plan you mention of drawing different parts of the same machine in different colours, has been practised for some time in the office in which I am employed, and I am familiar with it. I do not conceive its usefulness to consist in "the facility it affords of finding the same part in all the three drawings, by means of its colour," but on the contrary, I think, if you confine yourself to that rule, you will materially lessen the good to be derived from it; nor will you find it advisable to separate your drawing into "planes" or "spaces," and draw every thing included in the first space in one colour, in the second space of another colour, &c. &c. In fact, I never heard of any fixed rules, nor do I know of any which will secure all the advantages of the method in all cases; it must be left to the judgment of the person using it.

The maker of a machine should be sufficiently familiar with it to distinguish the representation of each part, the outline of which can be traced, and to find that part in all the drawings in which it is exhibited, without assistance from its colour; and ought not to want any thing to help him in remembering the several parts, or in comprehending the various uses for which they are intended. You will perhaps say, "if this is granted, in what is the method superior to that of drawing in one colour only?" It appears to me essentially useful, in drawing a number of things which are fixed one behind another, and which are *nearly alike in size and form;* for unless they resemble each other very closely, they will be sufficiently distinct without having recourse to this method. For instance, suppose you were drawing the end view of an axis, which had a number of wheels fixed upon it, each of which differed so much from the others in size, that its teeth were entirely inside or outside of their teeth: in this case, the outline of each would be easily traced, although they were all drawn of one colour. But suppose several of these wheels were the same in diameter, with a trifling variation in the pitch, or number of teeth, if they were all drawn in the same colour it would be impossible to trace the outline of any one of them without the assistance of instruments. But draw one in black, another in blue, another in red, and so on, and the outline of each will be at once manifest, however much it may interfere with the outline of the rest. When the plan of this spindle and wheels is drawn, each wheel may be drawn in the same colour as the end view, or not, according to circumstances. If there is nothing immediately under the spindle and wheels, the same colours may be adhered to as in the end view; but if there is any thing under them, it will be found most advantageous to draw them in the plan all of one colour, and draw those things which are beneath them in other colours, without regard to the colours of the end view.

You tell me that any improvement which you may happen to suggest, although approved and adopted, is received by your employers "as if their allowing your ingenuity to do them service were an act of condescension." This is certainly discouraging, and, I must admit, evinces any thing but good taste or good feeling: still I advise you to name any improvement which may occur to you; it will keep your mind active, and prevent your sinking into a mere delineator of other men's inventions. If your employers choose to submit to the humiliation of *knowing*, without the capability of *feeling* themselves obliged, let them settle the affair with themselves as they may. Matters of taste, however, although not without a certain measure of importance, are, in machinery, secondary considerations; and if I were in your place I should avoid all controversy about them. There are persons who are constitutionally devoid of every thing like

taste—who have no more idea of the forms and proportions that give pleasure to the eye, than they have of a seventh sense. It is absolutely necessary to give such persons entirely their own way, for nothing pleases them so well as their own designs, for which they seem to have a sort of maternal affection. Besides, I think you will find it far less mortifying to see the monstrous production of another man's brain, than to have the beauty of any design of your's spoiled by some hideous addition, which makes it look as if the little beauty it has left were the consequence of the designer having made a mistake, and blundered into something good without knowing its value. Such abortions, are, in my opinion, far more offensive and annoying than a form which is altogether uncouth.

The want of taste sometimes betrayed by machinists is really surprising. I could point out a steam engine made by a man of some note, who spared neither pains nor money to make it a superior looking machine, for which purpose he has introduced a profusion of bright work and mouldings, and increased the number of its parts for the purpose of adding to its beauty. Among other additions, there are two columns, one on each side of the side pipes, and sturdy-looking columns they are: one stands quite alone; the other is attached to the side pipes by a projecting deformity near the capital, as if to prevent its falling. Unfortunately, there is nothing which these columns are required to support; consequently they look as if they were parts of some incomplete structure, and seem as if they had puzzled even the man who fixed them to know what business they had there; for as an apology for their being stuck where they are, only in the way, he has placed an acorn-shaped piece of cast iron on the top of each, which he miscalls an *ornament*. There is a great deal of good workmanship wasted upon the engine. Half the money that has been thrown away upon its tawdry decorations, would, if judiciously applied, have made it an elegant machine.

Wishing you every success,
I remain, your sincere friend,

C. G. JARVIS.

September, 1832.

A THOUGHT ON CONFLAGRATIONS OF DWELLING-HOUSES.

Sir,—Mr. Baddeley's account of the decrease of fires in London, for the last few years, must be truly gratifying to every individual; but more especially to the worthy inventors of "fire-escapes," who have devoted their time and talents to the means of preserving the lives of their fellow-beings. I remember being in Edinburgh during the great fires there in 1826 (?) when the Covenant-close, a part of the High-street, the Tron church, and the Parliament-square, were burnt down. The scenes were awfully grand; the tottering walls stood shivering in the wind, threatening immediate destruction to all around them. The roofs were falling in with dreadful noise, and all beneath them

> "Crush'd horrible, convulsing heaven and earth."

Notwithstanding the extensive ravages of the conflagration, and the fire-escapes being unavailable in many instances, from the immense height of the houses, there were comparatively few lives lost, because the communications with the street were not cut off, from the circumstance of the houses having stone stairs from the ground to the attics. Had such extensive fires happened with the houses of the middle classes in London, as was the case of those of the High-street and Covenant-close in Edinburgh, the loss of life would have been dreadful.

With due respect for the considerateness of the London architects and builders, I cannot but regret that, while the houses of the nobility are provided with stone stairs for the purpose of safety, the stairs of the dwellings of a more useful class of persons are (to save expense) constructed of wood. This is not all—the staircase-walls are constructed of lath and standard, (as a wooden stairs does not require a brick-wall, having a bearing from the foundation to support it, as is the case with stone stairs,) and those partitions are generally filled in with sawdust between the lath and quartering, which, when it becomes thoroughly dry, ignites like shavings on the slightest instance of fire. It is a curious circumstance that, in three different houses where I have seen slight accidents by fire, all of them originated in or near the staircase. Had they happened at times when immediate assistance could not be pro-

cured, a few minutes would have cut off the communication with the street; and then the only hopes left would have been to attempt an escape by the roof, which would have been extremely dangerous for females, invalids, and children. A friend of mine, who has paid much attention to this subject, firmly believes that many lives are lost in London from the staircase being so readily burnt down. I should therefore suggest, that no house whatever (but especially those of two or three stories high) should be built without stone stairs; and the staircase-walls must then, of necessity, be of brickwork. As the difficulty and expense of procuring stone in London is considerable, stairs might be constructed of cast-iron; and although there may be an objection to the material, inasmuch as the iron would become red-hot in many instances, it must, however, be remembered, that a "red-hot" stairs to escape by is better than no means of escape at all. Many persons may consider this a subject of but little moment; but if even the life of one individual were saved in the space of ten years, by building all houses with fire-proof staircases, the plan would be worth consideration.

Should the foregoing imperfect thought give rise to some inquiry into this important subject, the wish of the writer will be satisfied.

I remain, Sir,
Your obedient, humble servant,
R.

Bayswater, Feb. 1, 1833.

NORTH LONDON LITERARY AND SCIENTIFIC INSTITUTION.

We are glad to find that this youthful Institution is already in a very thriving state. Professor Ritchie, of the London University, delivered at its rooms on Thursday, last week, an excellent introductory lecture, or rather inaugural dissertation, "On the best Mode of imparting Knowledge to Young People." We were much pleased with some of the strictures passed by the learned Professor on the prevailing systems of education. He maintained, with great show of reason, that instead of teachers possessed of ordinary abilities being, as usual, employed to impart the first principles of education, and those of great talent to teach the higher branches, the case should be exactly reversed, inasmuch as first principles constitute the foundation upon which the whole superstructure of a man's education is built, and upon which its soundness depends. He adverted also very pointedly to the indifference which is too commonly shown to the intellectual improvement of the female portion of the community, although from children being more with their mothers than their fathers, their characters take throughout life the stamp of maternal influence; and dwelt with merited approbation on the provision made in this Institution for the admission of ladies to the lectures and to the use of the library. Dr. Ritchie is to be followed in the lecture-room chair by Mr. Innes on Elocution, Mr. Francis on Electricity, Mr. Tucker on the Belles Lettres, and Mr. A. Booth on Chemistry.

MISCELLANEOUS.

News! News!—We extract the following very veritable account of the progress which has been made in the introduction of steam-carriages on the common roads of England from a New York paper. We should like to know to which of the family of the Longbows the American editor has been indebted for his information:—"At length their exertions have been crowned with success, and now vehicles, not drawn by horses, but propelled by inanimate power, are being introduced on the principal thoroughfares of the United Kingdom * * These carriages attract the greatest attention in England. *The roads where they ply* (???) are crowded with speculators. The stage-coachmen stop their horses, and people on horseback draw up, to see them pass * * The speed of these new vehicles is, on an average, twelve miles an hour."

Marble Statuary unsuitable to the English Climate.—(From a Correspondent.)—Mr. Chantrey had an offer of executing the whole of the sculpture of the marble archway in front of Buckingham Palace; but, with a magnanimity characteristic of true genius, declined it entirely, on the ground that no work of art in marble, if exposed to the open air in this country, could have any chance of immortality. When asked for an example, he gave a decisive one:—"The statue of Queen Anne, in front of St. Paul's, is now wearing its *second head.*"

Steam Navigation.—It is stated in a letter from Cherbourg, that Professor Pelletan is busily engaged there with the solution of a problem in steam navigation of the highest interest. The steam-boat with which he makes his experiments is without wheels; the propulsive motion being obtained by means of two long pipes, one on each side of the vessel, through which the water is passed from stem to stern. According to the learned Professor's calculations, a ship thus fitted up will have as great speed as any other description of steam-vessels.—*Recueil Industriel.*

The Dundee and Newtyle Railway is now in full operation for the conveyance of goods and passengers; but as yet the performances upon it have been by no means remarkable for their celerity. The distance is only 11 miles; and the time taken to accomplish it varies from 75 to 85 minutes.

INTERIM NOTICES.

"Animo" may rest assured we shall "not flinch;" we have not leisure, however, to answer his challenge this week.

Communications received from Mr. Scott — Mr. Bennett—T. J. C.—An Artisan—Nemo—A Constant Reader—Mr. Pearson—Mr. Marsh.

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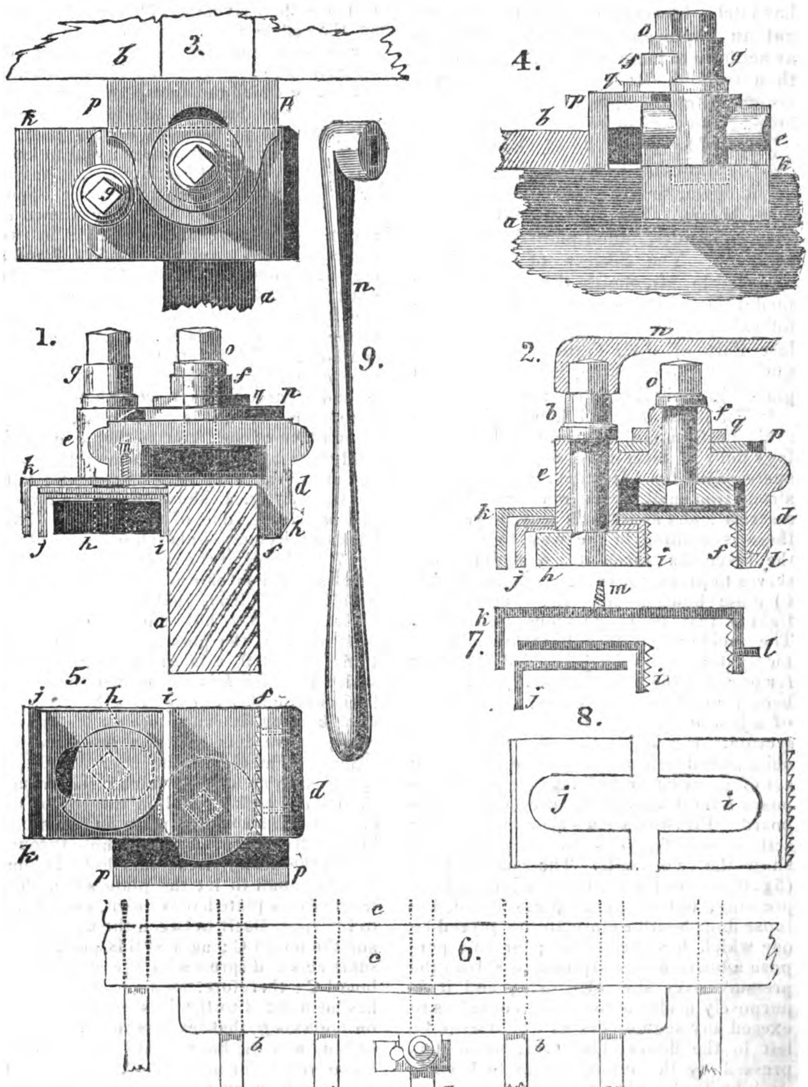
SMITH'S IMPROVED FLOORING-CRAMP.



SMITH'S IMPROVED FLOORING-CRAMP.

We gave in this Journal for the 10th of January, 1829, a description of the flooring-cramp invented by Mr. Andrew Smith, of Princes-street, Leicester-square. Of such utility has this instrument proved, that we understand Mr. Smith has since that time manufactured and sold upwards of 2,000. The ingenious inventor has lately, however, contrived so important an improvement in its construction as actually to increase its efficiency more than twofold. It consists mainly in a horizontal application of the instrument instead of a vertical one, by which means a joist can be taken hold of, and the flooring-board pressed home, previous to nailing it down, nearly three times quicker than before. The instrument in this form is, besides, much more durable and compact. The Society of Arts have awarded to Mr. Smith their large silver medal for the improvement; and the following is the description given, in the last Part of their Transactions, of the model of the machine, which has been placed in their Repository:—

"The joists of good floors being tolerably uniform in thickness, the clamp that lays hold of them does not require much spare room for adjustment; therefore, a strong iron snail serves readily instead of a screw; and as its axis may be vertical, there is nothing in the way to obstruct the lever that turns it. A similar snail serves to press the clamping-board *b* (fig. 6) close home against the board *c*, and tighten that board previous to nailing. The machine, therefore, has two snails, one for tightening it on a joist, and the other for pressing the boards close. Fig. 1 is a back-view of the cramp, having tight hold of a joist *a*. Fig. 2 is a similar view in section. Fig. 3 is a top-view of the machine, fixed tight on the joist *a*, and in the act of pressing or holding the clamping-board *b* tight against the preceding floor-board. Fig. 4 is a side-view in the same action; and fig. 5 is an under-view to show the two snails. The smaller view (fig. 6) shows the cramp on a joist not yet pressing, but ready to press home, the loose floor-board *c* close to the preceding one which has been nailed; for this purpose a board *b* is interposed to spread the pressure over several joists; and it is purposely made so hollow or curved as to exceed any such errors as would ever be left in the floors; therefore, when it is pressed by the cramp so as to become straight, the boards *c c* are sure to be close, and the workman knows that he has got the due degree of pressure, and that he may commence nailing. Its construction is as follows.—

"In figs. 1 and 2, *d e* is a clamped-shaped piece of cast-iron; the side *e* is deficient in length, but it has a hollow pipe through which the strong vertical axis *g* passes; this has a square head by which it may be turned; the bottom is also square, to receive on it the snail *h*, fig. 5, which is then riveted. This snail makes up the deficient length of the side *e*, and becomes the opposing force to the side *d*, for this lower portion only is to form the clamp, by which the cramp is securely attached to any joist *a*. In order to spread this pressure of the snail on the joist, a plate of iron *i* is interposed; and to keep this plate loose and yet in place, it passes over the snail and descends on the opposite side *j*; and, for the convenience of making or putting together, it is in two pieces, riveted together. In figs. 7 and 8 they are shown separated. To protect the snail from any violence, it is covered by a cap *k*, but this cap is only a prolongation of the back of the clamp. In its top there is a hole, which fits tight on the neck or pipe *e*, and then it passes over to the side *d*, and separates this lower portion from the upper. At *d* it is bent down, so as to form a face of soft iron to that side; it is held there by two rivets, shown in fig. 5, and at the side *e* by two screws; the dotted lines *l*, fig. 2, show one of the rivets, and *m*, fig. 1, one of the screws. This back of the clamp is also shown separate in fig. 7, with one of the rivets and one of the screws. The faces *e* and *f*, fig. 2, are purposely of soft iron, that they may be cut up like a rasp to hold more securely the joist without the possibility of slipping. In fig. 2 and 9, *n* is the key or lever by which the snail *h* is turned till the joist *a* is tightly held, as in fig. 1, with the partition *k* lying flat and close on it. In the space above this partition is placed another snail level with the floor-boards; it is turned by an axis *o*, which rises through the middle neck *f*; and on the top of the cramp is laid a sliding plate *pp* (seen best in figs. 3 and 4), it having a hole through which the neck *f* rises; this hole is elongated enough to let the plate slide. The front of this plate hangs down, as in fig. 4, to interpose itself between the upper snail and the board C; against this portion the snail acts and spreads its pressure on the board C; therefore, as soon as the clamp has been fixed to the joist by the lever *n* on the axis *g*, that lever is removed to the axis *o*, and the floor-board pressed close home, ready for nailing. After the plate *p* has been put over the neck *f*, it is followed by a soft iron ring *g*, which is driven

tight on to the neck *f*, so as to become a flanch, and keep the plate *p* in place. The snails are, of course, made of such a rate as not to move of themselves so as to lose hold; yet they are very easily loosened by the lever, and less than one turn always serves to bind them tight."

LORD STANHOPE'S COMPOSITION FOR ROOFS.

The architects (Wyatville, Soane, Smirke, and Seward,) who were some time ago appointed by the Lords of the Treasury to inquire into the state of the new palace built on the site of Buckingham House, made a report with respect to the roof in the following terms:—

"The principal part of the roof of the palace is covered with a composition, commonly known by the name of Lord Stanhope's; and we cannot omit to express the strong doubts we entertain of the permanent security which it can afford against the effects of the weather. Upon a careful inspection of the state of the composition, we observe that it is at this time cracked in many places, upon different parts of the roof covered with it; and in the fissures of these cracks the wet remains until it is evaporated, or, what is more probable, absorbed in the brickwork under it. As it has been laid upon arches of bricks, formed between the iron bearers over the ceilings of the upper rooms, where there are two tier of these arches, one raised a little above the other, a considerable time may elapse before the rains have penetrated to the ceilings; but the wet has already penetrated through the covering of one room (the south-west tower), where there is only one tier of these arches. We are informed that means may be readily taken for closing these fissures; but as there can be no security against the recurrence of the mischief, from the same cause which has now produced it, and as the cracks are discovered only by a careful examination and the removal of the slates which are laid upon the surface of the composition, we are of opinion that it will be found necessary to remove it altogether, and substitute a covering of a more durable and effectual nature."

Mr. Nash, the architect of the palace, in answer to these objections, showed satisfactorily that they arose from the surveying architects not being sufficiently acquainted with the nature of the composition in question, and the manner of applying it; with respect to which he furnished the following very curious and instructive particulars:—

"I have reason to believe that not one of those gentlemen has ever had experience in the use of Lord Stanhope's composition * * *. If they had taken the trouble to inform themselves of the nature and qualities of the composition, they would have learned that the upper coat, in which they saw fissures, has not the slightest effect on the roof; that it is, from its nature and hardness, always full of cracks; and that though the fissures (as they invidiously call them) should be full of water, it could not penetrate the roof unless the first coat were to crack also; but the first coat, from its property, which is to dilate and contract with the weather, never can crack, and the water never can get into the fissures of the upper coat so long as the slates above remain perfect. That these slates are most durable will be evident, when the Committee learn that they are not laid on the surface, as invidiously described, but bedded in the upper coat whilst in a boiling state, insomuch that it is scarcely possible to break a slate so bedded. I have had experiments made at the palace, in the presence of an eminent architect, to ascertain the fact; and at Killymoon, in Ireland, whilst that castellated house was building, a large stone corbel, of more than a hundred weight, fell from a lofty tower on the flat beneath; the corbel, which was of hard stone, broke into several pieces, whilst the flat remained uninjured. This composition consists of three coats; namely, the first coat, composed of tar and chalk only, and which always remains elastic; the second coat is composed of the same materials, with the addition of coarse sand to harden it, in order to make a firm bed for the slates (and it is this sand which causes the cracks whilst the material is cooling); the third coat is the slates, which are bedded on the second coat whilst boiling hot, and effectually prevent any wet penetrating to the second coat, of which the slates (being bedded into it whilst in a boiling state) are an integral part, and from which they can only be separated with difficulty, and are immoveable by any other cause than force purposely applied to raise them, which has been done by the architects to many parts of the roof of the palace, very much to its injury. The covering is laid upon brick arches. That the *surmises* of the architects, that the water is making its way through these cement arches are most groundless, could easily have been ascertained by an examination of them. This is the most economical covering for

roofs that can be adopted; and I know of none (not even lead or copper) that have such properties. Not one of the fissures, so called, has hitherto admitted any wet to pass through; nor could any water get into these fissures whilst the slates are bedded on them. The cess-pool, at the angle of the small independent south-west tower, is the only place where they find a failure; and that is an evil to which every roof is liable where there is a cess-pool. Such is the nature of the composition, that any workman, with a hot iron, can, in a few minutes and at a trifling expense, repair any defective place, should an accident occur. But to these doubts and surmises of the architects, and to *their arguments founded on doubts*, I will oppose facts. I have used this composition for thirty-five years on a very large scale, and never have known it fail. The buildings covered during that period are now as sound as when first done. Indeed, all the houses I have ever built, which have flat roofs, are covered with it. Many years ago Lord Palmerston took off a lead flat at his house in Hanover-square, which was constantly leaking, and covered it with Lord Stanhope's composition. I am told it has never leaked since. Very many houses in Ireland I have covered with it; and at the Pavilion at Brighton, where the work has been done twelve years, and the composition is laid upon timber (much more likely to shrink than the iron and brick work at the palace), the water has never penetrated. The house in which I am now living has been done for seven years, with *one coat only* (without the upper coat and slates), and stands well. These incontrovertible facts I beg to oppose to the fears and conjectures expressed by the architects, and unhesitatingly to state my belief, that, if any composition is imperishable, it is that with which the palace is covered. I know not how the architects can recommend the substitution of a material of a "more durable and effectual nature," when they acknowledge that this has *not yet failed*, and that they only apprehend it *may fail;* and when they say also, that the cracks are discovered only by a careful examination, and the removal of the slates which are laid upon the surface of the composition, I am confident that if, instead of following the advice dictated by their fears, it be left till some defect really shall appear, a very few years (it has now stood four years) will show the fallacy of their arguments, the groundlessness of *their apprehensions*, and the impropriety of delivering an injurious opinion founded on ignorant fears."

THE EIGHTH PROPOSITION OF THE FIFTH BOOK OF EUCLID'S ELEMENTS.

Sir,—The objections stated (p. 252) by a Country Teacher of Mathematics against the soundness of the demonstration of the 8th proposition of the 5th book of Euclid, as given by the late Professor Playfair, are not new. The same doubts I have often heard stated; and I well remember having about twenty-two years ago had some conversation with Professor Playfair himself on the same subject, in consequence of my having mentioned to him that similar objections had been made by Mr. Ingram, of Leith, in his edition of Euclid's Elements. At this distance of time I cannot recapitulate all the conversation that passed on the subject; but this I perfectly remember the Professor having said:—"Well, notwithstanding this, I shall not alter my demonstration in any subsequent editions." Nor did he. Neither has his able successor, Professor Wallace, in any of his editions of Playfair's Geometry, made the slightest alteration in the demonstration of the said proposition.

The "Country Teacher" has shown, that certain arithmetical values may be assigned for A, B, C, m and n, such that $m(A+B) = (n-1)C$; and this will always be the case when $m \cdot n-1 \mathrel{.:} C : A+B$ (mA and mB being by hypothesis greater than C); in every other case, $m(A+B) \neq (n-1)C$. So that it is clear m and n may have thousands of values assigned them, and yet $m(A+B) \neq (n-1)C$. But even granting that $m(A+B)$ should be equal to $(n-1)C$, what then? Is it not proved that mA is less than $(n-1)C$, that is, that the multiple of the first is not less than the multiple of the second, but the multiple of the third *less* than the multiple of the fourth? Then, surely, if we give full latitude to the meaning of the seventh definition, we are entitled to conclude, that the first has to the second a greater ratio than the third has to the fourth.

Dr. Simson, it is true, has demonstrated that the multiple of the first is greater than the multiple of the second, while the multiple of the third is less than the multiple of the fourth. And this is all very well; but it is, in fact, proving *more* than the seventh definition absolutely requires. If we adopt the

concise language of algebra, Simson's demonstration will be as follows:—

Let mA and mB be each of them greater than C, and let nC be the least multiple of C that exceeds mA $\therefore nC-C$ will not be greater than mA; but because mB is greater than C $\therefore nC-C+C \angle mA+mB$, that is, $m(A+B) \urcorner nC$, but $mA \angle nC$ $\therefore A+B : C \urcorner A : C$.

But, after all, a slight alteration in Professor Playfair's demonstration will answer the confined view of the "Country Teacher's" notion of the seventh definition.

Let mA and mB be each of them greater than 2C, and let nC be the least multiple of C that exceeds $mA+mB$, then $nC-C$ is not greater than $mA+mB$; consequently, $nC-2C$ will be less than $mA+mB$, that is, $m(A+B) \urcorner (n-2)C$. But because $nC \urcorner mA+mB$ and 2C less than mB $\therefore nC-2C \urcorner mA$, or $mA \angle (n-2)C$, therefore the multiple of $A+B$ by m exceeds the multiple of C by $n-2$, but the multiple of A by m does not exceed the multiple of C by $n-2$; therefore, $A+B$ has to C a greater ratio than A has to C.—Q. E. D.

I am, Sir, yours, &c.
GEORGE SCOTT.

3, York-buildings, New-road,
Feb. 14, 1833.

Sir,—Your valuable Magazine has often been the medium of exposing and correcting errors in scientific publications by authors whose celebrity had, in general estimation, raised them almost above fallibility. At p. 282, of your current volume, a "Country Teacher" has pointed out a fallacy in the late Professor Playfair's demonstration of the eighth proposition of Euclid's fifth book; and this, indeed, is not the only error which occurs in the same book in this edition of the Elements, nor is your work the first in which it has been publicly noticed.

The late Mr. Ingram, in his very excellent edition of Dr. Simson's Euclid, (Edinburgh, 1819,) after pointing out an inaccuracy "in the middle of the Professor's demonstration of 4 of V," adverts thus to the proposition noticed by your correspondent:—

"Again, he (Playfair) has given a different construction of the eighth proposition from that given by Simson, which has rendered the following reasoning quite inconclusive:—'Let nC,' says the Professor, 'be the least multiple of C that exceeds $mA+mB$, then $nC-C$, that is, $(n-1)$ C will be less than $mA+mB$,' which is not true; for it is evident, that *they may be equal*, as may be shown in innumerable cases. For instance, let $A+B=pC$, then $mA+mB=mpC$, therefore $n=mp+1$, and $(n-1)$ $C=mp$ $C=mA+mB$. Now, the whole force of the reasoning depends upon the truth of this false inference, and therefore the conclusion is altogether gratuitous. In the thirteenth proposition there is a similar inference, but there the force of the demonstration does not depend so much upon it."

Dr. Simson's demonstration is indisputable, but its prolixity renders it obscure. Ingram's is perfectly legitimate, and, at the same time, far more concise, and really quite as simple as the Euclidian doctrine of proportion, that is, proportion applied to incommensurable as well as commensurable magnitudes, seems capable of admitting. As Ingram's Euclid is easily accessible, perhaps it would be deemed a work of supererogation to transcribe his demonstration for your columns.

Notwithstanding that these errors had been thus noticed in a reputable work, from which, shortly after its publication, the learned Professor had transferred to his pages two new demonstrations in plane trigonometry, ascribing their invention, however, to a private teacher in Edinburgh, at the very time when Ingram's work was, as he himself states, to be seen in every bookseller's shop in that city, is it not very strange that these errors should not only have been retained in the subsequent editions published during the life of the author, but also in the posthumous edition "printed under the *care* (!) of Professor Wallace, of Edinburgh"? And is it not "passing strange" that Dr. Lardner should have copied this very demonstration of the eighth proposition into his edition of the Elements, (London, 1828,) published "for the use of students in, and preparing for, the London University"? So much for editorial circumspection!

Trusting this communication will be satisfactory to a "Country Teacher," I beg the insertion of the following geometrical problem, and request the attention to it of your scientific readers in town and country:—

To construct a plane triangle, *geometrically*, there are given two of its sides, and the radius of its inscribed circle.

I am, Sir, yours respectfully,
RANALD WEST.

Feb. 11, 1833.

LIBRARY OF USEFUL KNOWLEDGE.

Sir,—There are some people who find fault with every thing, from an inherent love of contradiction. I am not, I hope, one of that sort. There are occasions, however, when it becomes the duty of those who fancy they perceive a defect, to point it out, and thus, if possible, be the means of procuring a remedy.

With the exception of the 'Farmers' Series,' and the 'Gallery of Portraits,' I possess all the publications of the Society for the Diffusion of Useful Knowledge. I know very little about horses, although I have two of those useful quadrupeds,—one is a rocking-horse, for the exercise and amusement of my children, the other is a hobby-horse, which is kept exclusively for my own use. The 'Portraits' I have no occasion for, because I have the 'Portrait Gallery' published by Fisher and Co., and which I consider very superior, both as respects the engravings and the biographical notices, to the 'Gallery of Portraits' by the Society. But I may be wrong. I have often wondered whether the title of the latter work was hit upon by mere accident, and without any reference to the justly earned popularity of its elder contemporary. Time would fail me now to enter upon the merits of the 'Penny Magazine' and 'Penny Cyclopædia.' What every body says, I suppose, must be true. Nevertheless, I like to have an opinion of my own. At some future period there may be no harm in giving it. The 'Maps' of the Society are undeniably excellent for their price. The same may be said of the volumes of the 'Library of Entertaining Knowledge,' and, with a few trifling exceptions, of the 'British Almanac,' the 'Companion to the Almanac,' and the 'Working Man's Companion.' The 'Journal of Education' seems neither one thing nor the other. It appears to me a kind of literary go-between—professing to be extremely liberal, yet extremely exclusive; but carefully contriving to conceal alike its purpose and its principles. In the January Number is an edifying puff direct of itself and its associates in the list of the Society's publications.

With the 'Library of Useful Knowledge' I am, at present, chiefly concerned. In a literary point of view, and as relates to the original professions and declared objects of the Society, I do think it a complete failure. Nothing can well be imagined more injudicious on the part of the Society, and more perplexing, yea annoying, to the subscribers, than its plan of publication. It reminds me of the 'try your luck in the lucky-bag,' as practised by old women at country fairs. It is never known a day before that of publication what is forthcoming; and of late, when it has come, disappointment has been more frequent than gratification. At the end of last year, 144 numbers of the 'Library of Useful Knowledge' had been published. Out of this number four volumes only are complete, leaving 91 numbers, (some of which certainly are complete in themselves) in a scattered and unfinished form. It is a bad plan to have too many irons in the fire at the same time. Herein I conceive the Society has erred; for whilst I cheerfully allow that some of the Useful Knowledge publications are very ably written, others are the most meagre, incorrect, uninteresting, and uninstructive productions that can well be imagined.

The approval of the 'committee' cannot surely have been obtained on behalf of all of its publications. If it has, then it affords a practical proof that in a multitude of counsellors there is not always wisdom. Let any person who is in any degree conversant with the reading tastes of the mass of the population, in towns where education has already done much for the present generation, cast their eye over those parts of the Library of Useful Knowledge published only during the last year, and I am greatly mistaken if they do not allow that at least one half of them are of no more value than waste paper. In making these remarks I am not influenced by any selfish or invidious motive. I freely express my opinion; and in a matter of such notoriety, and as concerns hundreds of individuals, I may perhaps add, in a matter of such importance, I feel it is my duty to do so. If I were assured that what I am writing would meet the eye of my Lord Brougham, I should feel the better

satisfied in not having flinched from stating what I believe to be the truth.

There are other conditions requisite for rendering knowledge useful besides that of rendering it cheap. This is only one step, although I allow it is a very important one. Knowledge, to be useful, must be adapted to the wants and wishes, to the tastes and habits of thinking, of those for whom it is intended.

I belong to a 'Literary and Scientific Institution,' to which is attached a library for the use of the members. The publications of the Useful Knowledge Society very properly form a part of that library. At a committee, held a short time since, the librarian of the institution reported that not one in twenty of the treatises of the 'Library of Useful Knowledge' were read by the members. A vote for their discontinuance was unanimously passed. Other works were substituted for them, which appear better calculated to further the design of the institution. Here is at least one instance of the inutility of the publications to which I have adverted. If the present course be pursued is it not probable that other institutions will follow the example of that to which I belong?

Let me not be misunderstood. To the committee and to the members of the Useful Knowledge Society generally, I yield full credit for the sincerity and the kindness of their motives. They have the advancement of knowledge, and the good of their fellow-men consequent thereon, at heart. They will do well, however, not to be like a boatman, who looks one way but rows in an opposite direction. As a commercial speculation there is no doubt but the projectors of the Society have reason to be satisfied with the success of their plans. But something more than this was promised, and something more, I think, the friends and promoters of knowledge have a right to expect.

The unprecedented sale of some of the Society's publications is often referred to as indicative of their excellence. This must be viewed under certain limitations. The extraordinary sale is attributable, in some measure, to the extraordinary circumstances by which that sale is effected. Here it is that the operations of the Society assume the character of those of an overwhelming joint-stock company, whose proprietory consists of some of the most influential literary and scientific men in every principal town in the united kingdom. In this respect the Society enjoys peculiar privileges, and although its publications stand upon the commercial principle, it cannot be denied that it is a principle peculiarly and exclusively its own.

In all that I have written my only desire has been to direct the attention of the members of the Society to the 'Library of Useful Knowledge.' As at present conducted it reflects no honor on the Society, although some of the treatises are an honour to their writers. Viewed as a whole, it is any thing but what it ought to be. There is abundance of room for amendment. I hope there will be no lack of inclination in those to whose department the choice of works for publication especially belongs.

IRON.

Jan. 3, 1833.

CONDENSATION OF ATMOSPHERIC AIR.

Sir,—Mr. Rutter has proposed for explanation, (current volume, p. 201,) a phenomenon observed in the condensation of atmospheric air, and Mr. Cheverton has given an explanation (p. 251). The latter gentleman's solution does not appear to me satisfactory, and I beg to suggest the following as more to the purpose:—

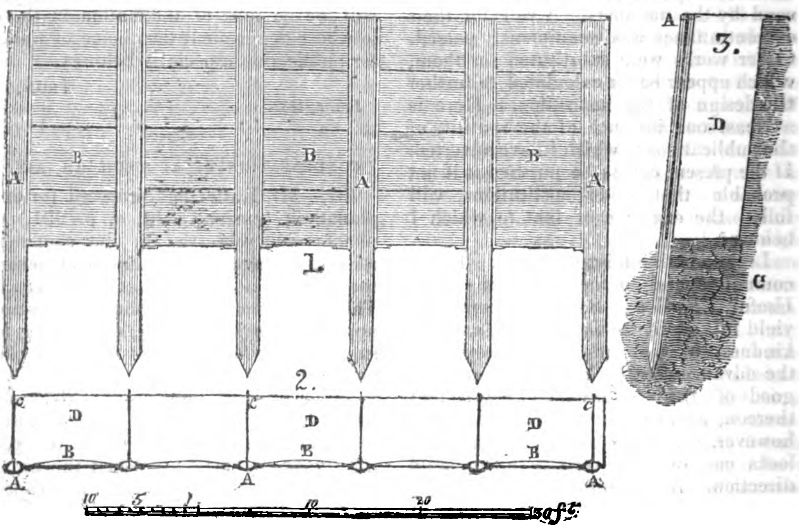
When the air is condensed, it gives out much heat; this the condensing vessel receives and accumulates, until an equilibrium is established. When the air is again set free, it expands and escapes far quicker than the heat, which it lost, can be restored from the sides of the vessel. The air that rushes out recovers its heat immediately from the surrounding air with which it mixes, but that which stays in is obliged to await the slower communication from the vessel. If the cock be now shut, this communication will go on, restored heat will accumulate in the air remaining included, and with it expansive force, which expansive force will manifest itself, on opening the cock after an interval, by the expulsion of a new portion of air; and the same operation will be repeated at intervals, until the heat of the remaining air and of the sides of the vessel are

again in equilibrio. This I think conveys the true secret of the loss of elasticity sustained by condensed air. If condensers could be lined with an absolutely non-conducting substance, there would be no loss of elasticity, further than perhaps a very slight one, attributable to the cause Mr. Cheverton has assigned. The celebrated Papin once tried to establish a communication between two engines, by means of air compressed in a tube about a mile long, and he failed; if his tube had been lined with wood, I think he would have succeeded. The law then of the expansibility of compressed air may be stated thus: if compressed air, on being set free, can have all the heat it lost *instantly* supplied to it, it will instantly resume its former bulk; if the heat can only be supplied gradually, it will only as gradually recover its entire original bulk. This subject presents I think a very interesting field for experiment. I have, however, Mr. Editor, already trespassed too long on your patience, and so beg leave to sign myself,

Your obedient servant,

φ. μ.

MR. SIBLEY'S IMPROVED MODE OF CONSTRUCTING RIVER WALLS.



Sir,—The accompanying sketches represent a new mode of constructing a river wall with a cast iron facing, which prevents the necessity of using coffer dams. It has been successfully adopted at the Island Lead and Patent Metal Works, Limehouse, and appears to answer its intended purpose perfectly.

The considerations that led to the adoption of this plan, the invention of Mr. Robert Sibley, surveyor, were briefly as follows:—The Limehouse cut of the river Lea having been deepened by dredging nearly five feet below the apron of the Thames lock, has caused the wharf walls in front of the Island Lead and Patent Metal Works to sink and fall into ruin; their foundations being not more than one foot below the original cutting. To reinstate them with foundations laid at a safe depth would have required coffer dams, which would have been not only expensive, but, in consequence of the extensive traffic of the large Ware barges on that river, subject to continual injury; besides which it would have been attended with both inconvenience and danger, to excavate so much below the foundation of buildings containing so much heavy machinery as these

works do. Add to all these circumstances the limited space for conducting the works without inconvenience to the operations of the manufactory, and the propriety of the mode of proceeding which Mr. Sibley adopted, will be manifest. Fig. 1. is an elevation of the cast iron facing in question; fig. 2. a ground plan; and fig. 3. a section. It is composed of piles (AA) of inch and a half metal, driven in at regular distances, and of plates or panels (BB) also of inch and a half metal, which fill up the intermediate spaces and slide into grooves in the sides of the piles. The original wharf wall had slipped so far as to admit most of the piles to be driven into their proper places; and to obtain an accuracy in the line of the face, holes were bored of eight inches diameter, nearly to the intended depth. This was effected by driving iron pipes, placed at a proper distance apart, a small distance into the earth, and when the boring was completed these were withdrawn and the piles inserted, by which means a perfect line was procured. The piles weighed about one ton and a quarter each, and were driven with a monkey, and a doll or block of elm in the pile, each pile being cast hollow. The plates forming the panels weighed half a ton each. When the entire facing had been thus completed, wrought iron ties (CC) were introduced through the piles, and attached to the building by nuts, and concrete (DD) to the breadth of two yards was backed in, formed of lias lime one-sixth and clean Thames ballast.

The cost, I understand, did not exceed five pounds per lineal foot. I am happy to hear that this ingenious and useful invention is to be used in a new river or wharf wall, to be made from the New London Bridge to Billingsgate.

I am, Sir,

Yours, &c.

A CONSTANT READER.

METHOD OF COATING LEAD PIPES AND IRON CASTINGS WITH TIN.

Coating Lead Pipes.

The following improved process for this purpose is the subject of a patent granted to Mr. Thos. Ewbank, of New York, dated May 18, 1832. We heard several months ago of a very superior means of tinning lead pipes having been found out in this country; but whether it is similar to the present, or a prior discovery, we are unable to say.

Take the lead pipes, *after they have been drawn to the required size*, and coat them with tin, either on both sides or on the inside only, as may be desired. To do this prepare a bath of melted tin, in a vessel of a suitable form and size, which may vary according to the size of the pipe to be tinned. Regulate the heat of this bath, so that the tin shall continue in a fused state, without becoming sufficiently heated to melt the lead. This may be ascertained either by the use of a thermometer, or by testing it by a piece of lead, or by such a mixture of lead and tin as will fuse at a given temperature: with a little experience, however, a workman will not find any difficulty in accomplishing this object without such aids. When the pipe is to be tinned on the inside only, cover the outside with lampblack and size, or with any other article which will prevent the action of the tin upon it; then blow powdered rosin into the pipe. When it is to be tinned on both sides, the rosin is to be blown, or otherwise passed into the pipe, and the outside also is to be sprinkled with it, and it is then ready for the process. The melted tin should be kept covered with rosin, fat, or other suitable article, to prevent its oxidation, and to aid in the tinning. All that is necessary is then to pass the pipe through the melted tin, which, when the pieces are not of considerable length, may be easily managed by hand; or when of considerable length and weight, a rope and pulley, or any other suitable mechanical contrivance which the workman may prefer, may be resorted to. The coating of lead pipes with tin, simply, is not new, the same having been heretofore done, but in a manner less perfect than that which has been just described. The lead has been tinned in sheets, and afterwards made into pipes, or the pipes have been made and tinned, and afterwards drawn to the intended size. By neither of these processes, however, is the intended security obtained with the same certainty as by this process

of tinning the pipes *after* they are otherwise finished. The coating of tin is thus rendered more perfect, and those fissures are avoided which the former processes can scarcely fail to produce.

Coating Iron Castings.

The author of the process for this purpose is also an American—Mr. Isaiah Lukens, who gives the following account of it in a letter to the Franklin Journal.

"The surface of the casting is first to be made perfectly clean, by turning, or scraping away the outside. Filing does not answer as well as turning or scraping. Make an amalgam of tin with mercury, containing enough tin to form a soft solid, say of the consistency of butter at 60°. Prepare a dilute solution of muriatic acid; the muriatic acid of the shops diluted with about an equal weight of water, will give an acid of convenient strength. Heat the casting until so warm that on a further addition of heat it could not be held conveniently in the hand. Dip a clean linen rag into the dilute acid, and wash with it the surface of the casting where it is to be tinned. Upon another piece of clean linen take up some of the amalgam, and pass it over the surface which has been wet by the acid. A portion of the amalgam adheres; by rubbing the tin is precipitated upon the surface of the iron to which it is united, and the surface is tinned; after which the article should be immersed in a bath of melted tin and rosin to perfect the coating. The explanation I take to be this. The diluted acid, aided by heat, acts upon the casting, forming a chloride of iron; when the amalgam is presented to this, the chlorine leaves the iron to combine with the mercury, and the iron and tin are precipitated in very intimate union if not in chemical combination. I do not mean to lay particular stress upon this explanation; the steps of the process are detailed just as I have frequently taken them."

MIDLAND COUNTIES RAILWAY.

We have been favoured by a correspondent, at Alfreton, with the prospectus of a new line of railway, which is intended to be formed between Pinxton and Leicester, and copies of the relative surveys and estimates by Mr. Jessop and Mr. Glynn, engineers. The originators of the scheme are the coal-owners of Nottinghamshire and Derbyshire, and their motives avowedly of a self-interested description; but it promises, at the same time, so many important advantages to the whole of the interior of England, that it is not without sufficient reason it has been named the "Midland Counties Railway."

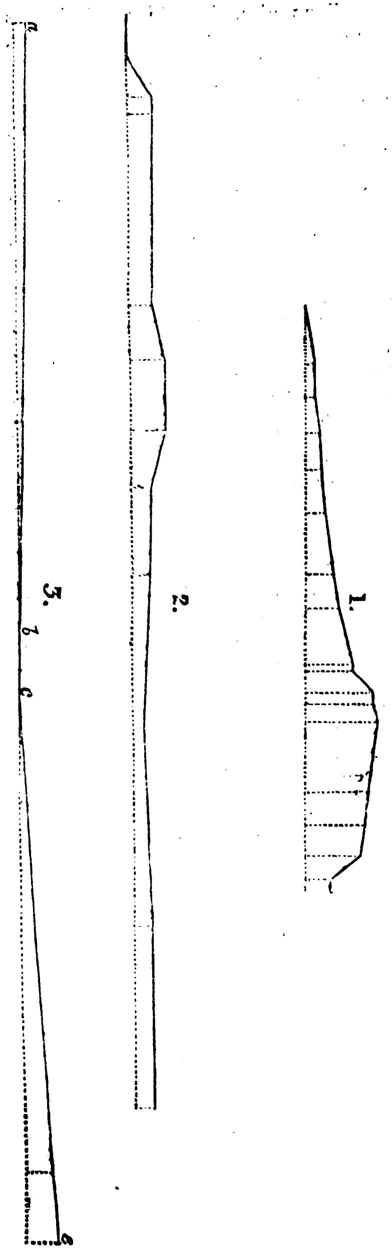
The market of Leicester, and indeed the whole district of country south of the Trent, had for a long time been chiefly supplied with coal brought down the Soar navigation from Derbyshire and Nottinghamshire; but of late this trade has been threatened with entire extinction, by the opening up of the nearer Leicestershire coal field, and the facilities obtained for the transport of its produce, by the formation of a railway from Swannington (which lies in the heart of that coal field) to the town of Leicester. The Derbyshire and Nottinghamshire coal-owners state, that they "endeavoured to induce the navigation companies to make such reduction in their rates of tonnage, as, with some sacrifice of price on the part of the collieries, should retain the trade, or at least a portion of it, in its ancient channels;" but that all their attempts for this purpose having proved fruitless, they have now "adopted the only alternative open to them, by proposing the formation of a railway to Leicester." The conduct of the navigation companies would seem to be as ungrateful as it is foolish; for it is afterwards stated that, "although the expenses of transit on the canals from Pinxton to Leicester have been great, and the navigation of the Soar very defective and dangerous," yet so extensive has been the traffic upon them, that it has yielded "200 per cent. on the Soar shares, 70 per cent. on the Erewash, and 18 per cent. on the Cromford and Leicester!"

But since the mere formation of a railway will not bring Derbyshire and Nottinghamshire nearer to Leicester than they are, how, it may be asked, can the projected undertaking enable the coal-owners of these counties to compete with those of Leicestershire, who are not only within half the distance, but have also

the advantage of railway conveyance to boast of? To understand how this may arise, we must inquire a little farther into the respective capabilities of the two railways, which are to be thus brought into competition.

The railway from Swannington to Leicester, though only sixteen miles long, is one of the most uneven and difficult to traverse in all England, consisting of a succession of very inclined planes—some rising as much as 1 in 16, and 1 in 29—and the whole reaching to an altitude of 370 feet. The railway from Pinxton to Leicester, on the contrary, will follow the natural course of the vallies of the Erewash and Soar, and have an uniform fall to the Trent, in the direction of what would be the principal trade, of no more than from 12 to 14 feet each mile; and then, after a dead level of two miles, a rise of only four feet in each mile to Leicester. In the whole course of the line, there will be no heavy or expensive work to encounter—no extensive cutting or lofty embankment, but merely such a removal of earth as will be requisite to raise the slight embankments in the meadow grounds which the railway will traverse, above the height of floods. The embankments, with two or three inconsiderable exceptions, will no where exceed ten feet in height. To show more clearly the great superiority which this railway will possess from these causes, as compared with the Swannington, or even with the Liverpool and Manchester, we have exhibited, in the annexed sketch, a comparative view of the three lines.

Fig. 1 is the Swannington line; fig. 2, the Liverpool and Manchester; and fig. 3, the "Midland Counties;" from *e* to *c* being the fall to the vale of Trent, and from *b* to *a* the rise to Leicester.



The first cost of constructing a railway of so level a description, and so much favoured by natural circumstances, as this of the "Midland Counties," must of course be a great deal less than where there are hills to be passed over or cut through, or deep ravines to be crossed, by high embankments or viaducts. Mr. Jessop calculates that the expense, per mile, will not exceed £6,323, while the Liverpool and Manchester cost £22,265; and that the whole of one line may be constructed for a sum little exceeding what was expended on the Swannington railway, though only of half the length.

It follows also, that in proportion as one railway is more level than another, goods may be transported upon it at a cheaper rate. Mr. Jessop estimates that the expense of transit on the Midland Counties Railway of thirty-four miles, will not be more than on the Swannington of 16 ; and this is in conformity with the experiments of Mr. Macneil, who found that the expense of drawing one ton over one mile on a dead level was more than doubled on such rates of acclivity as are exhibited on the Swannington line.

The fact last mentioned exemplifies, in a very striking manner, the great importance of making all lines of road, whether railways or common roads, as level as possible. We can scarcely, indeed, imagine a case in which so large a sum of money could be required to make a road level in the first instance, that it would not in the end be amply compensated for by the saving in the expense of transport. Mr. Macneil, whose authority stands deservedly high in such matters, has given it as his opinion, that if all our present roads were so levelled as to have even no greater rise than 1 in 35, " the expense would, in almost every instance, be saved in horse labour in a few years;" and Mr. M'Adam also states, as the result of his extensive experience, that " lowering hills, and improving the surface of roads," is invariably sound economy, " a good road being always the cheapest."

The Midland Counties Railway will have this farther advantage over the Swannington, that it will command, from its situation, an extensive traffic in a great many other articles besides coal, while the Swannington must always be confined to coal chiefly, the profit on which additional traffic must, of course, help to keep down the rates of charge for the transport of the more staple commodity. The prospectus makes mention of corn and merchandise of all kinds, the lime and gritstone of Derbyshire, the granite of Leicestershire, &c., but we shall quote, as of more general interest, what relates to the revenue to be derived from the " Midland Counties Railway," as a medium of communication between these counties and the rest of the kingdom.

" In the conveyance of passengers, and of the light packages transmitted by coach, the Midland Counties Railway is destined to be of the most extensive utility, benefiting alike the public and its proprietors. The income estimated to result from these sources, on the proposed railway from Sheffield to Manchester, a distance of 43½ miles, was £24,200 per annum, and admitting the accuracy of the calculation from which that estimate was derived, a return, not less proportionably ample, may be anticipated from a line of road which, by its direct and advantageous means of communication, cannot fail to attract so large a share of the intercourse between the northern and southern parts of the kingdom. By its aid alone, the distance between Leicester and Sheffield, and, consequently, between London and Sheffield, will be actually shortened about seven miles, and, from the increased speed of railway travelling, as compared with the usual modes of conveyance, these towns will thus, virtually, be brought nearer by a space equivalent to nearly three hours of time. Similar and equal advantages will be obtained by Mansfield, Alfreton, Chesterfield, Barnsley, and Leeds, and, in fact, by all towns northward of the latter, on the line of road with which it is connected, thus giving to the numerous and active population in their vicinities, including the greater part of the northern counties of England, and the whole of Scotland, a position, as measured by the usual rate of travelling, from 25 to 30 miles nearer to the metropolis. But, as regards the intercourse by post, the consequences available from this undertaking are of still greater value and importance. The transmission of the London mail for Sheffield, and certain of the intermediate towns, down this railway, would ensure its arrival in Alfreton by *half past eight o'clock* each morning, instead of *after twelve o'clock*, as at present ; and the distance of Alfreton from Sheffield being only 22 miles, the delivery of the mail, at the post-office of Sheffield, could be effected each day by *eleven o'clock!* An interval of four hours being allowed in Sheffield for the delivery and making up of the letter bags, and the answering of letters, the mail might be returned by the same route time enough to meet the Manchester mail at Leicester the same evening, thus giving to Sheffield and the intermediate towns of Alfreton, Mansfield, and Chesterfield, with their contiguous manufacturing districts, the very valuable privilege of a *daily exchange of correspondence with London*, all which would be effected at a *saving* to the Government of *two-thirds* of the *expense now incurred* in trans-

mitting the mail by the ordinary mode of conveyance, as has been fully established by the experience of the Liverpool and Manchester Railway."

Mr. Jessop, in his report, enforces the probability of a large revenue being derived from these sources, by reference to the well-known circumstance, that since the opening of the Liverpool and Manchester Railway the number of passengers between the two towns has increased three-fold; and Mr. Glynn adds another strong fact of the same kind, namely, that on the road between Stockton and Darlington there used to be only a single stage coach, drawn by a pair of horses, but that since the railway has been formed there are four carriages constantly employed upon it, each carrying twenty-four passengers.

The railway must of course be a double one, in order to adapt it to general traffic. Mr. Jessop estimates that the total cost of such a line will not exceed £215,000, and that one line, to begin with, may be completed for £130,000. As this is scarcely one-fourth of what the Liverpool and Manchester Railway actually cost, and falls much below the estimates for the London and Birmingham, and other lines, Mr. Jessop is at considerable pains to explain, in detail, how those local advantages, to which we have before alluded, happen to produce so material a difference. The results will be found embodied in the following very useful table which exhibits the comparative cost of one mile, on four different lines of railway:—

	Liverpool and Manchester.	London and Birmingham.	Manchester and Sheffield.	Midland Counties.
	£	£	£	£
Cuttings, and embankments, and forming the line of railway - -	8,133	6,924	2,380	1,575
Bridges, culverts, and masonry -	39,65	3,116	1,000	550
Tunnels - - - - -	1,122	2,225	3,000	——
Rails, pedestals, wedges, and pins -	2,187	1,893	1,620	1,565
Blocks and sleepers - - -	662	915	667	720
Ballasting the road, and laying down rails - - - -	663	915	860	485
Fixed machinery - - -	200	——	232	——
Fences and gates - - -	425	675	454	250
Land - - - - -	3,074	2,220	900	618
Contingencies - - - -	1,834	2,117	1,120	560
Average cost per mile - -	22,265	21,000	12,233	6,323

Mr. Jessop adds the following explanatory remark, with respect to the item of "Land."

"The slopes required in the excavations and embankments also add greatly to the quantity of land to be purchased, and to the compensations to be made for the inconvenience they occasion. The land required for the London and Birmingham Railway will average eleven and a half acres per mile, when five acres only will be required for the Midland Counties Railway."

Mr. Jessop's views of the manner in which the railway should be constructed, will be found explained in the following extract:—

"In preparing the estimate of the expense of the Midland Counties Railway, the object I have kept in view has been the construction of as perfect a railway as, in the present state of knowledge, is attainable, as well with reference to the line and the levels, as to the strength, the durability, and the permanent accuracy of the road. For a double line of railway, the width is calculated to be nine yards at the surface, allowing for the necessary slopes, and it is intended for the surface to be covered with a bed or foundation of gravel, broken stone, or furnace cinders, of the thickness of eight inches, on which the stone blocks, to support the rails, will be imbedded. The gauge of the railway, or the space between the rails, will be the same as that adopted on other public railways, namely, 4 feet 8½ inches, and the central space between the two lines, made usually equal to this, will be increased to six feet, a narrower interval having been found inconvenient. The rails will be formed of parallel bars of wrought iron, of a proper section, and in lengths of 15 feet, supported at every 3 feet by cast iron pedestals. The weight of the rails is estimated at 40 lbs. to each single yard, and that of the pedestal with a cast iron wedge, 16 lbs. each. I prefer the paralle bar to the elliptical or parabolic form

commonly used, inasmuch as greater strength is obtained by the pedestal becoming a fulcrum, as well as a support, to resist the action of the load; and to obtain the same advantage at the joining of the bars, they will be firmly united by means of larger and stronger pedestals."

We shall also extract from Mr. Glynn's Reports, a paragraph of useful information on the same head:—

"Since the introduction of wrought-iron bars for the formation of railways, the successive practical improvements in their manufacture and formation into suitable shapes, and the continual additions which have been made to their weight, as the price of iron was reduced, have combined in causing them to reach a degree of perfection they were not supposed capable of attaining only a few years ago. The rails used at Darlington, on the public railroad, weighed 28 pounds per yard in length; on the Liverpool Railway, 35 pounds to the yard; on the Newcastle and Carlisle Railway, now in progress, 45 to 50 pounds to the yard are intended to be used; and it is generally considered, that rails from 12 to 15 feet long, and not less than 40 pounds to the yard in length, supported on pedestals of cast iron of 12 to 14 pounds weight, placed three feet apart, into which the rails are firmly keyed, should be used for public railroads. These should rest upon large and broadly based blocks of stone, bedded solid in good materials."

The principal opposition which the Midland Counties Railway has hitherto encountered, is from the proprietors of the Leicestershire coal field and the Swannington railway; and among these the most active are Mr. George Stephenson (*proh pudor!*) and his friend Mr. Sandars, of Liverpool. The latter has addressed a very smart letter of dissuasion on the subject to the coal-owners of Derbyshire and Nottinghamshire; but so little influenced have they been by his arguments, and so little do they think them likely to influence others, that they have actually printed his letter and circulated it along with their own prospectus! It is but natural, that those who have embarked their fortunes in the Swannington speculation, should feel alarmed at a project which will interfere so materially with their prospects of gain; but it is not to be supposed, that any partial and local interest, like theirs, will be suffered to stand in the way of an undertaking of such evident general utility as the "Midland Counties Railway."

Immediately after the Act is obtained for the formation of this railway, measures are intended to be taken for the formation of two side lines to Derby and Nottingham, which will both branch off from the same point (Long Eaton); so that these towns will not only have a direct railway communication with Leicester, but with each other. Should the Pinxton line be afterwards extended (as it will in all probability be) from Leicester to the Birmingham and London railway, which will pass at the distance of about thirty miles, three more manufacturing towns of the first importance, Derby, Nottingham, and Leicester, will be brought within half a day's travel of the metropolis.

LONDON MECHANICS' INSTITUTION ANNIVERSARY.

The Ninth Anniversary of this Institution (which fell on the 6th of December last), was celebrated on Wednesday evening last, in the Theatre of the Institution.

Dr. Birkbeck, in an opening Address to the Meeting, observed, that if the contents of the mass of papers which had been sent into the Committee, in answer to the prize questions proposed for the past year were examined, it would be seen that the Members were neither idle nor ill informed. From the evidence which these documents afforded, he felt fortified in all the opinions respecting this Institution, which, in his enthusiasm, he had ventured to express on former occasions.

The following prizes were then awarded:—

£20 from Dr. Birkbeck, for the best Essay "On the Nature and Application of Steam," to Mr. M. A. Alderson—Five Competitors.

£10 from Mr. Senior, for the best Essay on "the Effects on the Wages of Labour, as ascertained both in Money and Commodities, of the Formation, Increase, and Decrease of Capital," to Mr. G. H. Pell, mercantile clerk—Three Competitors.

£10 from Mr. Bingham Baring, for the best Essay on "Combinations amongst Workmen," to Mr. Charles Fines, silver chaser—The only Competitor.

£10 from Mr. J. M. Morgan, for the best Essay on the question, "Whether does the Principle of Competition with separate Individual Interests, or the Principle of united Exertions, with combined and equal Interests, form the most secure Basis for the Constitution of Society," to Mr. Henry Price.

£3 from Mr. Holdsworth, for "the best Specimen of Drawing," to Mr. J. Elmslie.

£3 from ditto, for "the best Specimen of Machine Drawing," to Mr. W. A. Fletcher.

£3 from ditto, for "the best Specimen of Modelling," to Mr. A. Vodel.

£1 from ditto, for "the Second best Specimen of Modelling," to Mr. John Morris, junior.

A Prize of Books from Professor Rennie, for "the most correct Account of the natural History of any British Quadruped, Bird, or Insect," to Mr. Henry Brown, comb-maker.—The animal chosen for the subject of the Essay, was the Domestic Cat.

A Copy of "Milne's Practical View of the Steam-Engine," to Mr. H. S. Barnard, for the Second best Drawing of Machinery.

After the presentation of the Prizes had been concluded, Mr. Roebuck, M.P., moved a resolution to the effect "that it was evident, from the display of talent which had been witnessed, that the Institution furnished means for the acquisition of Useful Knowledge." The motion was seconded by Mr. Babbage, and carried unanimously.

Dr. Birkbeck announced the following Prizes for 1833:—

£10 from "A Noble Personage," for the best Essay on the Question, "Should Emulation be excluded from a System of Education; and if so, in what manner is that Love of Applause, so natural to Man, to be directed and regulated?"

£10 10s. from Robert M'William, Esq., for the "best Plan of a Building for a Court of Justice."

£5 from Dr. Lardner—Subject not fixed.

The thanks of the Meeting were then, on the motion of Mr. Basil Montagu, voted to Dr. Birkbeck.

The palpable defect of all these triumphal Anniversary displays is, that the number of real Mechanics belonging to the Institution is always studiously concealed. Of the sixteen successful competitors on this occasion, only three are stated to be mechanics; and it may be fairly presumed, from this, that they are the only individuals entitled to the designation. Now, though it may be very true, that the Institution, according to the words of Mr. Roebuck's resolution, furnishes "means for the acquisition of Useful Knowledge;" yet, unless it can at the same time be shown that the majority, or at least a very large proportion, of the individuals who avail themselves of these means, are of the class of Mechanics, the resolutions will affirm literally nothing as to its success as a *Mechanics'* Institution—which is the thing to be ascertained. We have been informed that not one-sixth of the members are mechanics; but whatever the actual proportion may be, Dr. Birkbeck and his Committee of Management *owe it to truth* to make the real state of the case officially and publicly known. We defy them to give a single honest reason for the concealment and evasion which they practise on this point. Dr. Birkbeck complained, in the course of the evening, that though he "had endeavoured to prevail upon the members of all the Mechanical Institutions throughout the kingdom, to favour him with the results of the plan of education pursued by each, he had received but few answers to his applications." We wonder it never occurred to the Doctor, that it might seem a strange thing to people, that a gentleman should busy himself so much about other Mechanics' Institutions, who has brought his own to such a pass that the number of mechanics belonging to it durst not be confessed—should call for *the plans* pursued by others, who had never a plan of his own, though he has been nine years at the task of concocting one—and who prides himself in being at the head of a *Mechanics'* Institution, which (we firmly believe) is no more a *Mechanics'* Institution in reality, than it is a School of Medicine, of Surgery, or of any thing else.

ANSWERS TO INQUIRIES.

Architectural Plaster Casts.—Sir, I perceive among the "Interim Notices" in your last Number one relative to some plaster models of the Parthenon. Who the specific modeller you refer to, is, I know not, but I have seen extremely beautiful plaster models, on a small scale, of the portico of the Parthenon, prepared and sold by Mr. Day, the celebrated architectural modeller. They contained the sculptures of the tympanum and of the metopes; and were so well executed, that I think it almost an impossibility for them to be excelled. Mr. Day, who is personally unknown to me, and whom I have no interest in recommending, resides at No. 12, Darlington-place, Southwark Bridge road; and he will, I dare say, be very glad to supply any person with a copy of the model who may wish to purchase one.—I am, yours, &c., Pit.—Feb. 11, 1833.

Candle-Snuffing.—We forget by whom the experiments to which "Iris" alludes were made, but he is right as to the result; they proved, that snuff a candle as often as you please, it will not consume one moment the faster.

Strength of Iron Bars.—We think the apprehensions of "A Factory Proprietor" have abundant reason in them; he ought to stop the work, and refer the matter to some scientific engineer. His builder is right in asserting, that wrought-iron bars will bear a strain of upwards of 20 tons to the square inch, that is to say, that it will take more than that weight to break them; but, in practice, it is never thought prudent to load iron bearers with much more than one-half the weight that will break them. Seventeen tons per square inch we consider the height of temerity.

Highgate Tunnel.—H. L. of Finchley, has been misinformed. It was the late Mr. Rennie who designed the tunnel which fell in; and Mr. Nash who erected the present archway.

MISCELLANEOUS.

Saltash Steam Floating Bridge.—A bridge at the Saltash Ferry had long been ardently desired by the public, and an endless variety of plans propounded by the influential gentlemen in the vicinity had proved abortive. To hit upon an expedient which should perfect the land conveyance between the two counties, without interfering with the navigation on the river, and the restrictions of Government, was given up as hopeless; still, from the spirit of enterprise (the river Dart having first become tributary), the Tamar at last yields to science and the arts. The float forms a parallelogram of about 50 feet by 30 feet, open at both ends; the centre is occupied by two engines of 6-horse power each, boxed over from end to end, so as to be entirely concealed externally; the engines work two wheels, on which rest two chains, which are laid from shore to shore and traverse through the engine-room. On either side the engine-room is a

clear space of 50 feet by 10, for carriages, horses, cattle, and foot-passengers. Carriages of every description are run in and out without detaching the horses; and the passage is accomplished in five minutes. The prows or platforms for shipping and landing are four in number, two at each end, each 21 feet long by 10. They are so arranged as to drop on the shore and form almost a level platform.—*Devonport Telegraph.*

Application of Illuminated Lime to Microscopic Purposes.—Lieut. Drummond's discovery of the intense light produced by an illuminated ball of lime, has just been applied with wonderful effect to microscopic purposes, by Mr. Cooper, the chemical lecturer, and Mr. Cary, optician. They have contrived an apparatus, to which they have given the name of the Hydro-oxygen Microscope, by means of which a stream of oxygen gas, and another of hydrogen, are projected upon a mass of lime, when a light of such brilliancy is produced by the triple combination, that a lens applied to it magnifies test objects exposed to it from ten thousand to half a million times! A hair of an infant appears like a tube two inches in diameter; the sting of a bee is a monstrous barbed weapon, four feet long; a worm which, to the naked eye, is like a thin thread, takes the magnitude of a large-sized boa constrictor.

LIST OF NEW PATENTS GRANTED BETWEEN THE 20TH OF JANUARY AND THE 21ST OF FEBRUARY, 1833.

John M'Curdy, of Southampton-row, for certain improvements in machinery for acquiring power in rivers and currents. Partly communicated by a foreigner. To enrol within six months from 22d of January.

Luke Hebert, of Paternoster-row, civil engineer, for certain improvements in machines or apparatus for, and in the process of, manufacturing bread from grain, and the application of other products for another product thereof to certain useful purposes. Jan. 24; six months.

John Warner, the younger, of the Crescent, Jewin-street, London, brass founder, for certain improved processes in giving a metallic coating to various articles of commerce. Jan. 24; six months.

Robert Stephenson, of Newcastle-upon-Tyne, engineer, for certain improvements in the locomotive steam-engines now in use for the quick conveyance of passengers and goods upon edge-railways. Jan. 26; six months.

William North, of Stangate-wharf, Lambeth, slater, for an improvement in roofing or covering of houses, or other buildings or places. Jan. 29; six months.

John Samuel Dawes, of Badford Works, West Bromwich, iron master, for certain improvements in the manufacture of iron. Jan. 29; six months.

Richard Butler, of Austin-friars, London, merchant, for improvements in manufacturing, obtaining, or producing oil from certain substances; and in extracting, producing, or obtaining gas from the same or such like substances, or from the oil produced therefrom. Jan. 29; six months.

Edwin Appleby, of Doncaster, iron-founder, for certain improvements in steam-engines. Jan. 29; six months.

John Reedhead, of Henry-street, Lambeth, Esq., for certain improvements in the construction of coaches, waggons, or other carriages used for the transporting or conveying goods and passengers, to be drawn by horses or propelled by steam or other motive power. Jan. 29; six months.

John Linton, of Selby, brazier, for an improved construction of steam-boilers. Jan. 29; six months.

Josiah John Guest, of Dowlais Iron Works, Merthyr Tidvil, Esq., for an improvement in the process used for reducing iron ore, and other materials containing iron, to what is called in the iron trade finers. Jan. 31; four months.

James Lutton, of Dean-street, Soho, Middlesex, chair-maker, for certain improvements in easy chairs. Jan. 31; two months.

Jonathan Dickson and James Ikin, both of Holland-street, Blackfriars-road, engineers, for improvements in the process of making gas from coal or other substances. Feb. 6; six months.

William Crofts, late of Lenton, but now of Radford, both in the county of Nottingham, mechanic, for certain improvements in certain machinery for manufacturing of bobbin-net lace. Feb. 11; six months.

William Crofts, late of Lenton, but now of Radford, both in the county of Nottingham, mechanic, for an improved mode of combining together and actuating certain parts of machinery already known and used for making lace commonly called bobbin-net. Feb. 11; six months.

Edward Lucas, of Edward-street, Birmingham, engineer, for a self-acting force and lift pump. Feb. 11; six months.

James Brown, of Margaret-street, Commercial-road, rigger, for certain improvements in capstans and apparatus to be used therewith. Feb. 14; six months.

William Rhodes, of the Grange, Leyton, county of Essex, brickmaker, for an improved manufacture of bricks for building purposes. Feb. 14; six months.

Thomas Robinson Williams, Esq., late of Norfolk-street, Strand, for a new combination of fibrous materials, forming by means of machinery artificial skins, which may be applied for the purposes for which skins, leather, vellum, and parchment, are now used. Feb. 14; six months.

Luke Hebert, of Hampstead-road, civil engineer, and James Don, of No. 9, Lower James-street, Golden-square, for certain improvements in engines, and other machinery employed in the construction of steam-vessels and steam-carriages, a portion of which improvements is applicable to other purposes. Part of which improvement was communicated by a foreigner. Feb. 21; six months.

Thomas Hills, the younger, of St. Michael's-alley, Cornhill, gent., for a certain improvement in furnaces for steam-boilers and other useful purposes. Feb. 21; six months.

Alexander Gordon, of the Strand, engineer, for certain improvements in the boilers or generators of steam or vapour, and in condensing such steam or vapour, and in engines to be worked by steam or vapour for propelling or actuating machinery and carriages on land, and boats or vessels or other floating bodies on water. Being a communication made to him by a certain foreigner. Feb. 21; six months.

Robert Hicks, of Wimpole-street, Middlesex, Esq., for an improved method of, and apparatus for, baking bread. Feb. 21; six months.

INTERIM NOTICES.

C. Bowly will find T.'s plan for erecting Mile Cottages in the Mechanics' Magazine of 10th March, 1832.

We should be glad to have the "Sketch and Description" alluded to by "An Economist," in order that we may insert it along with her letter.

We respect the motives of "Vindex," but think the matter had better rest where it is for the present.

Communications received from Mr. Dewhurst—Φ. μ.—Mr. Williams—Mr. Mallet—Mr. Sharp—J. V. V.

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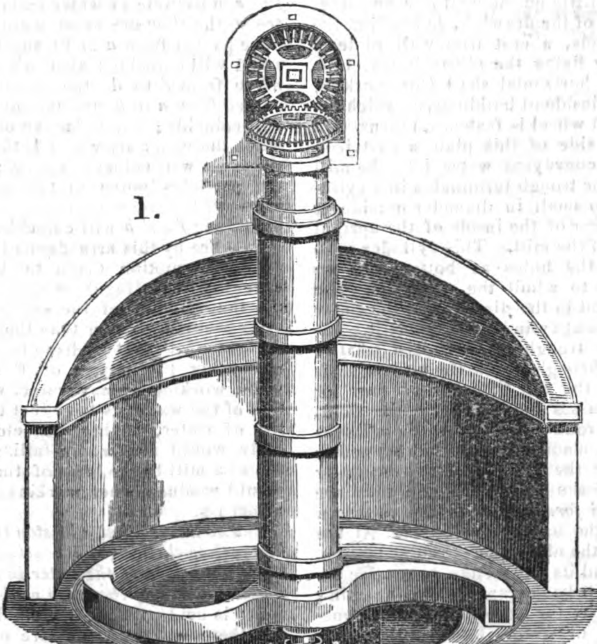
Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 499.] SATURDAY, MARCH 2, 1833. [Price 3d.

BARKER'S MILL IMPROVED.

1.



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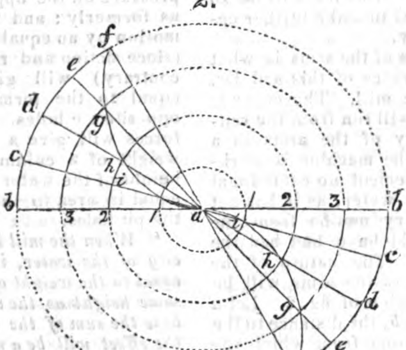


BARKER'S MILL IMPROVED.

The prefixed engravings represent an ingenious improvement in Barker's mill, which has been suggested by Mr. James Whiteland, a correspondent of the *Franklin Journal.* The following is Mr. W.'s own description of it:—

"The mill (in fig. 1) is represented as working a little off the wall of a building. At the top of the drawing, and behind the bevel wheels, a cast iron wall plate is shown, for fixing the pillow block, into which the horizontal shaft (for working machinery inside of buildings, on which the upper bevel wheel is fastened,) turns. On the under side of this plate a cast iron trough for conveying water into the mill is fixed; the trough terminates in a cylinder, just so small in diameter outside as to work clear of the inside of the upright cylinders of the mill. This cylinder is so long, and the holes at bottom are so shaped, as to admit the water with the velocity, and in the direction of the water in the upright cylinder of the mill. Inside of the trough cylinder is a smaller cylinder, through which the upright shaft works; at the top is a larger part for holding brasses for steadying the shaft. Under the trough cylinder is the cylinder of the mill, made of wood, and hooped as shown. At the bottom of this cylinder the arms of the mill are fixed; they are of a *curved form.* Behind the mill is a niche for the arms to work in. At the bottom of the niche is a circular trough, higher round its outer edge, to receive the water after it has escaped from the mill; it is shown by the two ellipses at the bottom of the drawing. Below the mill is seen a square pit, for holding the step into which the foot of the upright shaft works. The other parts of the drawing will be so easily understood as to make further description unnecessary.

"The *curved form* of the arms is what constitutes the difference of this and Dr. Barker's plan of the mill. The curve is such that the water will run from the centre to the extremity of the arms in a *straight line* when the machine is working; by this arrangement no centrifugal force is given to the water, as it has not received any rotatory motion from the arms, which it would have had had the arms been straight. The nature of the curve *f, g, h, i, a,* of the arms will be understood by inspection of fig. 2. Let *a* be the centre, and *a, b,* the distance to the centre of the upper stone from which the water flows; also let the concentric circles 1, 2, 3, divide this distance into equal parts; and take *b, f,* equal to the distance at the extremity of the arms would pass, in the time that a particle of water would flow from the centre *a* to *b,* the extremity of the arms. Divide *b, f,* into the same number of equal parts that the distance *a, b,* is divided, and from these points let the lines *ca, da, ea,* be drawn to the centre. Now, since the motion of the water is uniform, and the motion of the arms uniform also, while the arms revolve from *f* to *e*, a particle of water leaving the centre at the time the arms were at *f,* shall have passed from *a* to 1; and the points *a* and 1 will coincide; also when the arms move from *f* to *d,* the water will have passed from *a* to *h,* and the points *h* and 2 will coincide; and so far the other points: when the water arrives at 4, the point *g* in the arms will coincide with 3; and when the particles move to the point *b,* the arms will have passed also to the same point, and *f* and *b* will coincide.

"Since by this arrangement there is no additional motion given to the effluent water by centrifugal or any other force till the velocity of the extremity of the arms becomes greater than the velocity of the water, all that we have to consider in estimating the power of this machine, when working at any velocity less than that of the water, is the effect that a quantity of water, having the velocity that a body would acquire in falling from the top of a mill to the level of the jet holes, would produce when working at different velocities.

"*The weight that will stop the mill must be equal to the weight of a column of water twice the height of the water in the mill, on a base the sum of the areas of the pit holes;* for it is evident that, if the holes be shut up, there will be a pressure on all sides equal to the weight of the column in the mill. Let, now, the holes be opened, the pressure on the opposite side will remain as formerly; and the water being set in motion by an equal pressure, the reaction (since action and reaction are equal and contrary) will give another pressure, equal to the former one, on the sides opposite the holes. Therefore, these two forces will give a pressure equal to the weight of a column of water twice the height of the water in the mill, on a base equal in area to the sum of the areas of the pit holes.

"*When the mill is working at the velocity of the water, it will raise a weight equal to the weight of a column of water the same height as the water in the mill, on a base the sum of the area of pit holes; and the effect will be a maximum, and equal to the whole power of the water.* For it is evident that, as the water flows with the same velocity as it did before, the force of reaction will remain as great as ever; and

will just balance the above weight, or one-half of the weight that will stop the mill. And the other force, being caused by the pressure of the water on the areas opposite the holes, must cease when it has brought the velocity of the mill up to the velocity of the water, as this is as quick as the water can follow it. Therefore, with two forces, one to balance a weight equal to the pressure on the areas opposite to the holes, and the other to keep this weight in motion at the velocity of the water, an effect equal to the whole power of the water will be produced. For in the time that the water flows, with the velocity that it left the mill, a length equal to the height of water in the mill, this quantity of water, or an equivalent weight, can be raised to the top of the mill.

"The effect for the other velocities may be determined in the same way. When the velocity of the mill becomes greater than the velocity of the water, if there be no centrifugal force, the weight that the mill will work with must be the force of reaction, minus the force that will be required to carry the water round the mill.

"If the above theory is correct, I need say nothing of the advantages that this form of the machine has over the other forms, as indeed over every other water-mill. By considering how much power remains in the water after it has escaped from the mill, when working at different velocities, the same results may be obtained—an additional proof of the correctness of the above theory. Thus, when the mill is standing, the water escapes with its whole force, and no effect is produced: when working at the velocity of the water, the mill moves as quick as the water, and the water, after it has escaped, has no motion in any direction, but falls directly down. Now, since there is no power remaining in the water, its whole power must be spent in producing an effect equal to its power in keeping the mill and resistance in motion. The power, when the mill is working at one-half, or any other velocity, may be determined in the same way. As the motion of the mill is just as quick as that of the water, the portion of the circumference *b*, *f*, must be taken equal to the length of the radius or arms, if the areas of the holes and arms are alike: if the holes be smaller than the arms, the portion *b*, *f*, must be longer, in the same proportion as the water moves slower along the radius.

"A rotary steam-engine might be made in this way by sending steam through a mill working inside a condenser. The steam-pipe might be connected to the steam-wheel by a metallic packing. If the wheel was large in diameter, there would be very little friction, as it would require so small a pipe in proportion to the power of the engine. The power might be taken from the steam-wheel, and the motion reduced by letting the axis of the wheel rest on friction-rollers, and the power taken off the axis of the rollers by means of toothed wheels or other rollers. Another method would be to force water or any other liquid through a machine of this sort by steam."

THE ADVANTAGES OF EDUCATION;—THE MODE OF OBTAINING IT MOST SATISFACTORILY;—THE EFFECTS IT WILL HAVE ON MANUFACTURES, AND ON SOCIETY GENERALLY.

Sir,—This is a subject that, in the present state of society, demands our most fixed attention, and deepest consideration.

The organisation of man is such, that he is as susceptible as wax of receiving impressions in youth, be they good or bad, facts or falsehoods; and by these first impressions, together with the subsequent circumstances surrounding him from infancy to puberty, his character through life is chiefly formed. It must therefore be an important matter to teach individuals at an early period those things which may prove most available to them when they are thrown upon their own resources. As the present state of society is constituted, the greatest degree of cultivation of the physical powers, and the progressive improvement of the intellectual faculties, of a man, will ensure the best measure of health and the greatest degree of happiness. Much has been said in your Journal and in other works, on the subject of "education for the working classes;" but among the many recommendations for that purpose, the means of acquiring it, and the exact nature of the education most calculated to promote their happiness, have not been mentioned. It is a question, perhaps, how far a knowledge of letters, acquired in the best possible way, is productive of happiness; for, although education may humanise the feelings and soften the passions of individuals, as well as bring to light the many improvements for our ease and comfort which chemistry and mechanics have furnished us with—yet

"In days when mankind were but callans
For grammar, logic, and sic talen's,"

they were not one jot less happy than they are now; and the self-same progress of improvement that has enlightened mankind has also enfeebled them, to consider those things comforts which, in a less enlightened state, would give pain. Although Archimedes in finding out the specific gravity of bodies, or Herschel in adding another planet to our system, may be considered to have derived more happiness therefrom than is felt by a schoolboy who has got a holiday, or a rustic who by a discharge of his musket has brought a partridge to the ground, yet in reality the happiness of the two latter may be equal to that of the two former. Happiness consists in our having many physical and intellectual wants, and ample means to satisfy them, and in our approximation to the attainment of the object of our wishes.

While, however, I thus exhibit education as not being necessary, in one point of view, to the full enjoyment of happiness, I must admit that as it has become a sort of cunning or art, possessed by a few, and it is, in consequence, indispensably necessary that all should acquire it, in order to compete with and have like chances with others in the market in which our labour is exchanged for the necessaries of life, and to bring us to a level with those with whom we have to contend for the acquisition of those things which produce happiness—in short, that diamond may be enabled to cut diamond. But to recommend Government to educate a starving population would be about as absurd as the building and frequent rebuilding of a new palace, which is as often thrown down again; or the wasting of thousands on the erection of a triumphal arch, which serves no other purpose than being a monument of disgrace to the country in which it is built. The want of employment for the working classes, and an illiterate community, are two evils, which, to be effectually remedied, must be effectually struck at the root. Education may no doubt put the means in the power of individuals of procuring subsistence; but they must first be sustained during the acquirement of those means destined to be afterwards available in their own hands for their own benefit.

There is only one effectual way of educating and raising the character of the working classes, and that is by bettering the condition of the agricultural labourer. Let the peasantry of our country be but raised to the proper standard in the scale of society, and then the demand for mechanical labour will be raised with it; and, with the aid of mechanical invention, we may expect to see the number of hours for manual labour reduced, and the hours that are occupied well remunerated, so that the mechanic will not only have time to study his political rights and mature his mental faculties, but the means of affording education to his children, without having them taught the rudiments of slavery within the walls of a National School, conducted as those establishments are at present. I do not disapprove of those institutions, but of the present system of education taught in them.

The salvation of the agricultural labourer has engaged the attention of the ablest writers; and so much has already been said on the subject that I can add nothing to what has transpired: I allude to the reduction of large farms. By examining the Parliamentary reports for some time back, we find that from the commencement of the eighteenth century, or shortly afterwards, to the close of that century, the number of enclosure Bills which have been passed is very great. By this ruinous system the labourers were deprived of the means of sustenance for an occasional cow, sheep, or pig; and not being proprietors of their dwellings and small plots of land, the latter ultimately fell into the hands of their wealthier neighbours. The evil did not rest here; because the young men, who were deprived of the means of subsistence, betook themselves to the Army and Navy, and at the close of the late Continental wars returned to their native homes, and became a burden to their respective parishes—so much so that the poors' rates increased and pressed so heavily on the farmer that they were unable to pay their rents conveniently, much less to give employment to additional labourers.

In order to benefit all classes of society effectually, Government must retrace many of the steps which it has taken for the last one hundred and twenty years. We trust that a Reformed Parliament will take into consideration the thousands of acres of Crown lands which might be made available in some way

for the poor. The lands of the Church, too, beyond what are necessary for the decent maintenance of its ministers, might be appropriated to objects of national benefit. The landed proprietors must likewise give their assistance in that way which Government cannot accomplish,—*by reducing the large farms on their estates*;—by bringing the waste lands into cultivation;—by letting portions of land to small occupiers;—by reclaiming land from rivers, (as suggested by your correspondent, M., last vol. p. 227,) and by employing labourers in hedging, ditching, fencing, draining, felling timber, planting, road-making, &c.; all of which acts would enhance the value of their estates.

The efficacy of the system of letting small portions of land is obvious for the following reasons:—Suppose a farmer to possess an hundred acres of land—this might support his family, which might consist of at an average sixteen or eighteen persons. Now, if these hundred acres were let to thirty-three labourers, each of whose families averaged four persons—and if the farmer cultivate his land with the plough, and the cottagers with spade husbandry, we find the 100 acres supporting eighteen individuals in the one case, and 132 in the other; and in the latter case more than triple the produce would be sent to the market; because the live stock of all the cottagers put together would amount to much more than the farmer could rear *. The good effects of this system has been tried successfully by the "Labourers' Friend Society;" but this Society has its defects, and their method may only be considered as the best of a bad system; inasmuch as the quantity of land which they allow for each cottager (being only a quarter of an acre) is not sufficient to keep them from the point of starvation, and never gives the industrious an opportunity of accumulating by their industry the means of raising themselves above the grovelling state of wretchedness which they are now in.

Having thus bettered the condition of the agricultural labourer, the better condition of the mechanical labourer must necessarily follow; because it is the labourers and rural population who would, had they the means, be the best customers, and in their aggregate number a comprehensive world of customers, to the manufacturers of all the articles essential to the comforts of life. And when these things are accomplished, but not till then, it will be high time to set about educating the working classes.

Before concluding this part of my subject, I cannot refrain from saying a few words to those disciples of Malthus who have raised a cry against over-population, while the goods produced were greater than the goods consumed, and rotting in their store-houses. I am aware that by recommending the division of large farms, and letting out small allotments, I must encounter the whole force of the Malthusian batteries; but is it enough for us to say that we must keep the working classes in a state of starvation, lest they should, by having their condition bettered, increase the population? This country has within herself sufficient resources with which to supply more than double the present population—great as that number may appear. We do not want the consumers lessened, but the produce better distributed, and some step of Government to give a stimulus to trade, that the working classes may be employed and put in possession of a fair return for their labour. Let us not trouble ourselves about improvident marriages, but direct our thoughts to the more noble subject of supplying the physical and intellectual wants of those beings that *are* in existance. I am surprised that a man so good and so liberal-minded as "Junius Redivivus" appears to be, should have reverted to this subject in his excellent little work, the "Producing Man's Companion." Aye, Sir, and others that might be named, of great celebrity, have written long and frequently on this subject, and considered education as the most effectual means of preventing improvident marriages; but I trust that we have a nobler aim than this for educating the working classes. Far different and far better was the philosophy of the labourer's wife, to whose husband Cobbett was explaining the doctrines of Malthus.—The man smiled, thinking his informant was in jest; but the wife, who was listening in silence all the while, could keep her temper no longer, and burst

* Those who would wish to inquire farther into this subject, might be highly gratified by the perusal of an excellent pamphlet entitled "A Peasant's Voice to Landowners."

out in a rage, exclaiming, "Oh! the wretch! to take the only comfort from us we have." Honest woman—I think I see her now, with one hand lifting up the corner of her apron, and tucking it under the string; and with the other hand pulling the strings of her cap, the same way that she no doubt would have done with Mr. Malthus's ears had he been there. Let me ask any of those check-population gentry, who have had conferred upon them the honourable titles of husband and father, and who are blessed with virtuous wives and hopeful children, what would they have in exchange for the pleasure which they derive from their family? Youth, health, and genuine affection are perhaps the best provisions that a young couple entering into marriage can have: let them be but possessed of these, and a fig for the rest. Again, those who have recommended the Malthusian doctrines, have made no provision whatever for those females whose happiness and hopes they would thereby destroy. What could be given to them in compensation for the society of an affectionate husband? Nothing—those hopes on which they now feed, although they may never be realised, would then be blasted for ever; and, when happiness has fled, the end of our being is destroyed.

I am aware that I shall have many opponents to these principles, who may consider that I have not weighed the subject deeply; but

> "Though fools spurn Hymen's gentle powers,
> We, who improve his golden hours,
> By sweet experience know
> That marriage, rightly understood,
> Gives to the tender and the good
> A paradise below."

Since education is the instrument or means by which those things can be procured that minister to our comfort, it may be considered the grand foundation on which we have to build our happiness. And to effect the welfare and stability of society, and to promote the union of sentiment, education must be free and universal, and begun at the earliest period of life, and made the means of spplying domestic, social, and political instruction. In Scotland every parish has its schoolmaster, who is a man of known talent and integrity. He educates the children for the small fee that can be spared by their poor parents, and has his salary made up by a small tax on the lands of the parish. Hence it is that persons from this country may be found holding responsible situations in every part of the world. When Government and landed proprietors shall have taken proper steps to afford employment to the working classes, they will then have an opportunity of educating their children through their own means. This might be done by a certain number of individuals clubbing together and engaging teachers after their own liking, whose principles were duly known, and who might be re-elected or discharged at a months' notice by the decision of the majority of a committee; and more easy circumstances would induce parents to bestow more attention on their children during their stay at school and afterwards, as this sort of domestic instruction by considerate parents is attended with the best consequences. But a permament and effectual system of education, to raise the character of the community—to unite the minds of the people, and cement the physical force of the country, must be recognised by the nation. Let free and universal education be commenced, under the auspices of a liberal and "responsible" Government, upon a solid and comprehensive foundation; and let the present establishment for infants be purged of those mystifying corruptions which the art of those who are adverse to the diffusion of knowledge have incorporated in the general system of teaching. Let us hear of nothing impressed upon the infant mind about obedience to superiors, &c., until it is first thoroughly understood by them that superiority consists in worth, and not in wealth. In those establishments where the children of the rich and poor are to be assembled, there must be no distinctions but by real merit. In addition to what is generally understood by education, it would be well to teach every individual the uses of the various instruments and implements of labour, and regular habits of industry. But above all, the intellectual education that is most wanted, after the rudiments of reading and writing have been acquired, is Natural History. This is a branch of education that has been greatly neglected in this country; indeed more so than in many countries on the Continent. When the youthful mind first begins to develope its faculties, im-

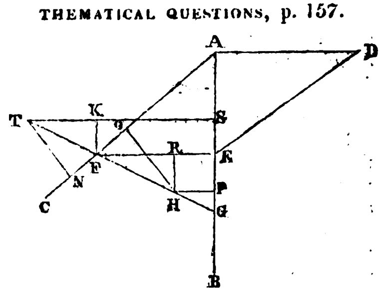
press upon it the beauties of nature, and it will soon be led "from Nature up to Nature's God." In addition to the state of gratitude that the feelings are brought into from an observance of nature, it moreover furnishes the mind with just ideas of what is beautiful. To every school, or establishment for education, there should be attached a garden, in order to forward this study of natural history, and to enable the boys to be instructed in all the branches of horticulture. No flogging should be resorted to in the schools, under any circumstances—(this practice has too great a resemblance to the disgraceful system of punishment practised in our army and navy)—as much more will be gained by a system of reasoning with the scholars, and pointing out the benefits that will result from good conduct, than by the reverse. The students should not be strictly confined to the schools and gardens, but frequently allowed to walk out with their teachers, and to visit all the different parts where machinery and other works of mechanical invention are to be seen in operation; and the passing from place to place, especially in the country, would afford them great scope for observing those features of nature not comprehended within the sphere of their own gardens. I do not so particularly recommend the teaching of natural history scientifically, as I do that every one should have a desire and love for nature, and, whether (in the botanical department) they know the Latin names of plants, or not, that they may recognise them individually in their minds, and show that consideration for even the commonest weed that every thinking person in the present day does to insects. If females, who have or ought to have the conducting of our domestic arrangements, were taught a little knowledge of plants, we should not have the eye so often offended with the many inconsistencies in the patterns of carpets, &c. which we are daily obliged to witness. An indulgence in botany might be afforded to persons after puberty, by having no new houses erected without gardens, where ground could be had; and, in towns and cities, by having cast iron balconies to each floor of every house, for supporting flower pots: which balconies would not only have a good architectural effect, but would also serve as places of retreat, in cases of fire, until ladders or other assistance could be procured. Gardens might even be made on the roofs of houses, as has been suggested by a celebrated author.

When food and employment for the working classes have been provided—when the children of this generation have received a domestic, a social, and political education, the state of society in the next generation will be totally different. We shall then have no manufacturers producing patterns of heterogeneous stuff, without any sense or meaning, as they would have no purchasers: carpets, shawls, waistcoat pieces, gown pieces, crockery, china, &c. &c., will represent some part of nature, which will not only be a source of pleasure to the generation by which they are produced, but means of instruction to forthcoming generations. Political education will strengthen the physical power of Britain, to guard her against a foreign foe; and a love and knowledge of nature will humanise the feelings of mankind, and lead them to offer unbounded gratitude to that Power who has furnished us with, and supports that source of nature by which we live and move, and from whence we have our being.

I have the honour to be,
Sir, your obedient, &c.
R.

Bayswater, Jan. 22, 1833.

SOLUTION OF THE SECOND OF THE MATHEMATICAL QUESTIONS, p. 157.



Question. — A B and A C being two straight lines given in position, find the locus of a point D, so that if straight lines D E, D F, be drawn perpendicular to A B, A C, the sum of the perpendiculars may be equal to a given straight line.

Let A B, A C, be the two straight lines given in position. Draw A D perpendicular to A B, and equal to the given sum of the perpendiculars; draw D E parallel to A C, meeting A B in E; draw E F perpendicular to A B, meeting A C in F; make AG=AF; join FG; then will FG be the locus required. For if in F G you take any point as H and draw H P, H O, H R perpendicular to A B, A C, E F: then R P is a rectangle ∴ R E=H P, and because A G = A F, the angle A F G = A G F = R H F, and the angles at O and R are right angles, and F H common to the two triangles O F H, and F R H ∴ H O = F R; and hence H O + H P = F E = A D.

Cor.—If the point be taken in the base produced, as T; draw T S, T N, perpendicular to A B, A C. In this case, the difference of the perpendiculars T S, T N, will be equal to A D. Draw F K perpendicular to T S, then it may be demonstrated as before, that T N = T K ∴ T S – T N = K S = F E = A D.

Cor. 2.—Hence if any point be taken in the base of an isosceles triangle, and another point be taken in the base produced, and perpendiculars drawn from the two points to the sides of the triangle; the sum of the former will be equal to the difference of the latter; and both will be equal to the perpendicular drawn from either of the angles at the base to the opposite side.

V. T. Hurtado.

Mansion-house School, Hammersmith,
January 26, 1833.

[Solutions of this problem have been also received from A Cambridge Student, (the Proposer), O. P. Q., A Westminster Scholar, and J. S.]

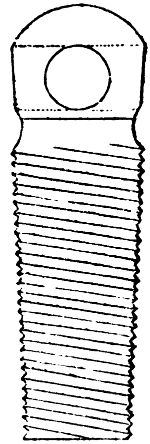
STONE-SPLITTING SCREWS.

Sir,—Some time since, while visiting the Bangor slate quarries, I was struck with the enormous waste of materials, arising from the mode adopted of shaking down large masses of slate to be afterwards split into roofing slates. The strata lie nearly vertical, and by every blast that is fired many tons of slate are shivered to atoms and made useless.

As a remedy for this, some powerful but simple application of the wedge appeared to me to be worthy of consideration. A conical male screw, working in a split female screw, placed in a jumper hole in the stone to be cleft, appeared one of the best that occurred; and, upon subsequent experiment, I find it to exceed my expectations, both for splitting, roofing, slatework, and all other stones.

Fig. 1 represents a vertical screw for

Fig. 1.



this purpose, made as an experimental one. It is about nine inches long in the screw, and two inches diameter at the lower end, and two inches and an eighth at the upper. It has a round thread, of as strong a form as possible, and a proper eye at top for the insertion of a lever. The two segments of a cylindrical shell, which form its nut or box, are each one-fourth the circumference of a complete cylinder, and half an inch in thickness; thus the jumper hole for this screw requires to be three inches diameter and nine inches deep.

The screw is made of iron, sheathed with steel like a tap, and hardened; and the box segments are made of cast iron, poured in an iron mould, which makes the screw threads very perfectly and cheaply; their brittleness and hardness are afterwards corrected by annealing. They alone are injured in the operation of splitting, and by this way of making them are easily replaced.

Now, I am fully aware of the objections that may be urged, of a conical screw being applied to a cylindrical one, and of the threads of a conical screw making variable angles with the axis; but the taper or angle of the cone requires to be but very small, being determined by the modulus of elasticity of the stone to be split, which in all rocks commonly met with is very low; so that the

screw being very coarse—having round threads, being very little taper, and not requiring to fit accurately—those objections are not cogent.

Fig. 2 represents one of the segments of the box or nut; and fig. 3 is an end-view of the two ($a\,a'$) in their places in the jumper hole; b, the screw.

Fig. 2.

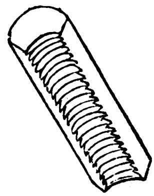
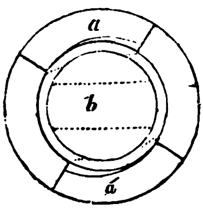
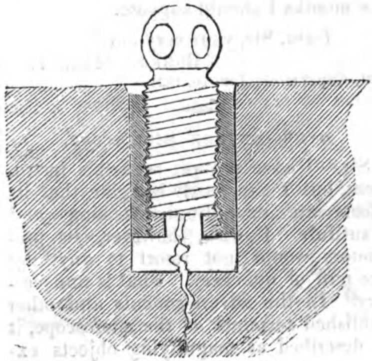


Fig. 3.



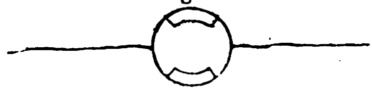
To use this apparatus, the jumper hole being prepared, the two segments are placed at opposite sides of it, and the screw inserted and screwed down. The friction of the stone against the back of the segments keeps them in their respective places. The screw must descend, and as it descends it must expand the segments, and by their expansion the stone is split (fig. 4.) I have found by

Fig. 4.



experiment that the rock will always split in the direction of the interval between the segments, as in fig. 5; so that

Fig. 5.



when a prolonged section of an homogeneous rock is required, it is easily produced by a number of such screws placed in the desired line, as in fig. 6. Omitting

Fig. 6.

the consideration of the effects of friction, which, I am fully aware, are in this case very considerable, but can only be determined by experiments, it is sufficiently obvious that the power of this instrument is the same as that of a wedge employed for cleaving, whose angle is equal to that of the cone round which the screw is wrapped, urged, or driven on by the energy due to the same screw, actuated by a lever of a given length.

The power of this screw, then, is expressed by

$$P = \frac{h}{2\pi R} W.$$

where P is the power or energy of the screw; h, the distance between two contiguous threads; π, the constant ratio of the diameter of a circle to its circumference; R, the length of the lever used; and W, the power or dead weight applied.

The power of the wedge, again, is given by the equation,

$$P = \frac{R\,l\,B}{L^2}$$

P representing the energy with which the power of the screw acts against the resistance of the particles of the stone, the length from the point or extremity of the cleft or split when *first commenced*, to that point where the resistance may be supposed concentrated against the sides of the wedge, *i. e.* the screw segments; and L, the length of the cleft when first commenced. It is obvious, that R, l, and L, vary with different kinds of stone, and are constant with each particular kind; whence, for want of experimental

data, it is impossible at present to reduce these equations to figures. The friction, too, of the instrument increases in a greater ratio than the pressure, from the continually increasing difference between the threads of the conical male screw and those of the cylindrical female screw.

So far, it will be admitted, I have not slurred over the difficulties and disadvantages to which the machine is exposed; but I have tried it, and the result of one experiment, at which the whole of the Commissioners of Public Works in this county, Mr. Vignoles, the engineer, of Liverpool, and Mr. John M'Mahon, of the firm of Henry Mullens and M'Mahon, were present, and expressed their entire satisfaction, will suffice.

Two men, with a lever of only *three feet in length*, and a single screw and segments of the size before described, split a mass of the argillaceous limestone of the county of Dublin (*Calp* of Kirwan), weighing nearly a ton, in 17 revolutions of the screw, made in about 25 or 30 seconds. The men did not put forth their strength, but merely walked round the stone, which was split contrary to its stratification and exactly in the line of separation of the segments. The sufficiency of the power is thus clearly shown.

Mr. John M'Mahon has informed me by note, that "he considers it a very great improvement in the art of quarrying."

This instrument is more particularly applicable to slate quarrying, and for the purpose of obtaining great tabular masses of granite, sienite, or other very hard and homogeneous rocks. In the former application the saving of slate, and of labour in clearing the *face* of slate-rock of the accumulating rubbish shook down by the method of blasting, recommend it. In the latter, the saving of labour, the certainty of the direction of the fracture, and the capability of splitting larger blocks than have been as yet attempted by wedges. It may be also applied to raising stratified rocks from their beds, and as a substitute for blasting in general. The jumper holes usually used for the granite of this county are three inches in diameter, and sometimes *sixteen feet* deep. Each of these screws only requires a jumper hole of nine inches deep, and three inches diameter, *and no gunpowder;* and it is hardly questionable but that 20 of these screws, requiring *less* labour of preparation, would produce a greater effect than the one blast, besides producing it in a predetermined direction.

There is another advantage of these screws over blasting, that they are free from danger to the workmen employed in using them. There is but one way that I am aware of in which it is possible for them to fail, namely, by the threads of the screw splitting off; but the force required to strip a steel screw of one-fourth of an inch round thread, in depth and width, when twelve or fourteen threads are engaged at once, is enormous; and when a number of screws are in action on one mass of rock, the force on any individual screw need not be great.

The first cost of such screws is not very great. The male or conical screws, being of hardened steel, will last a long time; and the segments are cheaply made, when once the mould is prepared, as they wear out or are broken. The cost of jumpers is less than for blasting purposes, as they are so much shorter. It is obvious, also, that these screws may be applied at the bottom of a fissure or jumper hole, as well as near the surface of the rock, by having the head of the screw properly prolonged.

Oil and black lead should be used to lubricate the screw during its descent. If a cast iron segment should break in the hole during the descent of the screw, it does not matter, as the pieces are still held by friction in their relative situations. The saving in gunpowder and labour alone, in such a place as the Bangor slate quarries, would pay the cost of some thousands of these screws, should they be found to succeed, in a few months I should suppose.

I am, Sir, your very obedient,
ROBERT MALLET.

94, Capel-street, Jan. 16, 1833.

HYDRO-OXYGEN MICROSCOPE.

Sir,—I have not yet seen this instrument, but I can easily imagine that its effects are exceedingly striking and beautiful. I wish, however, its proprietors would not resort to anything like puff or quackery. That is unnecessary. In the advertisements and other published accounts of the microscope, it is described as magnifying objects ex-

posed to it from 10,000 to 500,000 times. A little consideration will convince us that this is an exaggerated statement, and wholly unbecoming men of acknowledged science and respectability. I will quote only two instances in proof of my assertion. The sting of a bee is represented as appearing like "a monstrous barbed weapon, four feet long." If we take the sting of a bee at $\frac{1}{20}$ of an inch in length, and this, I think, will be acknowledged as a minimum, it would appear, if magnified 10,000 times, not four feet, but *forty-one* feet eight inches long!—"The hair of an infant appeared like a tube two inches in diameter."—Hair, even of infants, differs materially in size. Suppose in round numbers, we take the hair employed under the lens of the microscope to be $\frac{1}{1000}$ of an inch in diameter; that, if magnified 10,000 times, would appear *ten inches* in diameter, instead of two inches. I have said nothing of the 500,000 magnifying powers of the instrument. It really seems too absurd to demand a thought. Just fancy the hair of an infant appearing like a tube upwards of forty feet in diameter, and yet received on a disc 14 feet in diameter!

IRON.

Feb. 27, 1833.

P. S. I think the light employed for the microscope might be very successfully applied to a large magic lantern or phantasmagoria, by the aid of which a moving succession of figures could be exhibited to advantage.

SAFETY PISTOL.

Sir,—Having lately read a description of Somerville's safety gun, I am induced to think the same principle of a catch or double trigger might be as advantageously applied to pistols—with this difference, that, instead of employing the left-hand, I would place the key, &c. in such a position that it might be acted upon by the thumb or third finger of the same hand which is employed on the trigger. Little ingenuity would be requisite to arrange it so as to be equally serviceable to either hand, without disturbing the aim in the least.

I am Sir, &c.

J. N. B.

Southwark, Jan. 18, 1833.

THE EIGHTH PROPOSITION OF THE FIFTH BOOK OF EUCLID.

Sir,—I am afraid the "Country Teacher" of mathematics will be somewhat bewildered by the two explanations given by your very able correspondents, Messrs. Scott and West, respecting the soundness of Professor Playfair's demonstration of the Eighth Proposition of the Fifth Book of Euclid, and the merits of the substitute offered by Mr. Ingram. Mr. Scott evidently displays an unwillingness to acknowledge that there is the smallest blemish in the Professor's demonstration; and, to say the truth, I cannot blame him much; for I well remember he was one of that great mathematician's favourite pupils—by this I mean, one of the most distinguished, among a number of clever contemporaries, for his proficiency and skill. He asserts that when, of the equimultiples of four magnitudes, taken as in the fifth definition, the multiple of the first is *equal* to the multiple of the *second*, but the multiple of the *third* less than the multiple of the *fourth*, then the first has to the second a greater ratio than the third has to the fourth. There is no doubt but this must be the case, although it is not exactly so stated in the original definition. But even conceding this to Mr. Scott, there will still remain a defect in the Professor's demonstration, inasmuch as he asserts that $m\ (A \times B) > (n - 1)\ C$, although it is known that, in some cases, they may be equal. I apprehend that the Professor would have expressed the truth with more strictness, had he said that $m\ (A \times B)$ is not less than $(n-1)\ C$. Mr. Playfair has, in most of his demonstrations in the Fifth Book, closely imitated those of Dr. Simson; and it is to be regretted that he did not adhere to the same model in the eighth proposition. Both the demonstrations given by Mr. Scott, in your valuable Magazine, are, in my humble judgment, without a fault. The first, which is in imitation of Simson, is particularly concise and satisfactory. Professor Wallace would perhaps do well to adopt one of these demonstrations in his next edition of "Playfair's Geometry."

Mr. Ranald West has, I imagine, only studied in Mr. Ingram's school. He absolutely "deals damnation round the land:" Playfair, Wallace, Lardner, are or were all, according to him, mere noodles com-

pared with Ingram! Now, having myself had the honour to study both under Playfair and Ingram, I must be permitted to say that, whether considered as teachers or mathematicians, there was no sort of comparison between them. There is one thing which Mr. West repeats, on the authority of Ingram's last edition of Euclid, which I can affirm, of my own knowledge, not to be true. Mr. Ingram accused Playfair of ascribing two new demonstrations in plane trigonometry, which he had transferred into his "Geometry," to a private teacher of mathematics in Edinburgh, at the very time when Ingram's Euclid, containing these identical demonstrations, was to be seen in every bookseller's shop. The "private teacher" alluded to is no other than that able and scientific engineer, Mr. Jardine, a gentleman whom all who know him will allow to be utterly incapable of appropriating to himself the credit of another's labours. Now the truth is, that Mr. Jardine made out these demonstrations (while studying under Playfair) long before they appeared in Mr. Ingram's book; and how Mr. Ingram came by them I leave to others to divine.

Mr. Scott, I am inclined to think, must be in error when he says, "I well remember having, about twenty-two years ago, some conversation with Professor Playfair himself on the same subject, in consequence of my having mentioned to him that similar objections had been made by Mr. Ingram, of Leith, in his edition of 'Euclid's Elements.'" Mr. Scott will perhaps excuse me for bringing to his recollection that, about the period alluded to, a certain person, whom he was in the habit of humourously calling "the great little man," but who shall for the present be nameless, gave him a statement, in manuscript, of Mr. Ingram's objections, which he had from Mr. Ingram himself. Now query—whether it was not to this manuscript communication, rather than to the printed book, that Mr. Scott referred in his conversation with the Professor? I do not think that Mr. Ingram *published* his objection until 1819 (the year Playfair died); but of this I am not sure, as I have none of the old editions of his Euclid at hand to refer to.

I am, Sir, yours, &c.

EDINENSIS.

Cambridge, Feb. 25, 1833.

EXPERIMENT IN BOATING.

Sir,—You did me the favour, some months ago, to insert in your useful Magazine, an account of an experiment I made to propel a boat, so that in a great measure the back water did not break the force of the propellers. I have since made an experiment with oars, the result of which I will likewise thank you to insert.

There was a kind of scaffolding fastened to the boat, about four feet high; the haft ends of the oars were loaded with a heavy weight, to which was connected a balance weight, which worked on a pulley fastened to the scaffolding, which made it very little exertion to manage the oars. There was likewise a heavy pendulum hung from the scaffolding in the centre, which was connected with the hafts of the oars by a rope. Two persons worked at the oars, and one at the pendulum, so that, between the oars being loaded with weights, and being more easily managed from their being balanced on the pullies, and the person at the pendulum drawing at the same time as the rowers, the oars acquired great power.

Query—Could not boats be impelled in this way, with great velocity, with the aid of a small steam engine?

I am, Sir, yours, &c.

CADOGAN WILLIAMS.

SUGGESTION FOR THE CONSTRUCTION OF A NEW MUSICAL INSTRUMEMT.

Sir,—It is a fact well known to chemists, that if hydrogen gas is permitted to issue in a jet, through a straight tube, having a narrow bore, it will ignite on a lighted taper being applied, and constitute what Dr. Priestley denominated the philosophical candle. It is also a popular fact, that if a long glass tube, of about two or three feet in length, be held over the flame, moisture will bedew its sides, and harmonious tones will soon commence to sound. Now, since the year 1822, when this was beautifully exhibited to me by Professor Brande, it has occurred to my mind, that if a series of these tubes were placed in a frame, and the jets of different diameters, with the glass tubes *tuned*, in a similar manner to the musical glasses, a musical instrument might be constructed, and form a pleasing

philosophical toy. As my professional avocations prevent my constructing this instrument, I throw out these hints to your experimental readers, and particularly to my scientific friend, J. O. N. Rutter, Esq., of Lymington, who, from his extensive chemical knowledge, may perhaps throw some information on the subject. I conceive that an appropriate name for this instrument would be the HYDROGASEON. Should you deem this communication likely to interest your scientific readers, I shall feel gratified by your inserting it.

I remain, yours obediently,

H. W. DEWHURST, Surgeon,
Professor of Zoology and Anatomy.

Feb. 19, 1833.

ADMINISTRATION OF OXYGEN GAS IN CASES OF ASTHMA.

Sir,—On reading Mr. Rutter's letter (page 271) respecting his method of making oxygen gas, I am induced to communicate a plan which I had some time back, which is much simpler than Mr. Rutter's. I had an iron retort made, in size and shape like a quart bottle, with a gun-barrel screwed in the neck; and after putting in a quantity of manganese, I placed the retort in the kitchen fire. From this process I was able to make a large quantity of oxygen gas; certainly not so fast as by Mr. Rutter's plan; but every person has not the advantage of a coal-gas retort, which was my case. I cannot conclude my communication without stating for what purpose I then made oxygen gas. About seventeen years ago my wife was dreadfully afflicted with asthma, and could find nothing to relieve her till I made oxygen gas for her to breathe, which at all times afforded immediate relief.

I am, yours, &c.

JAMES SHARP.

Northampton, February 18, 1833.

DR. LARDNER ON HEAT.*

Of all natural agents, which is the most powerful, the most universal, the most familiar, and the most useful to man? HEAT. Yet of which of them do our books tell us less? "While almost every other branch of Natural Philosophy," as Dr. Lardner observes (we believe) truly, "has been made the subject of separate treatises without number, and some have been, as it were, set apart from the general mass of Natural Philosophy, and raised to the rank of distinct sciences, Heat alone has been left to form a chapter of chemistry, or to receive a passing notice in treatises on general physics."

So entirely does this remark hold good, that we have not even a separate name for the science of Heat. We elucidate the laws and the effects of light in dissertations upon "optics;" of water, in "hydrostatics;" of air, in "pneumatics;" but no one has ever put forth a treatise on "calorifics." It is at least quite as well that it should be so; but the naked circumstance that no learned Theban has ever deemed it worth his while to coin a jaw-breaking word of six or seven syllables, in order to save the lieges the disgrace of using so contemptible a monosyllable as "heat," in their discourse, is proof presumptive that the subject has not occupied so much of scientific attention as many others of infinitely inferior importance. At the first blush, it seems difficult to imagine the causes of this inattention; and the difficulty, unlike most others, only increases on further investigation; for then we discover that

"Heat is every where present. Every body that exists contains it without known limit. The most inert and rude masses are pregnant with it. Whatever we see, hear, smell, taste, or feel, is full of it. To its influence is due that endless variety of forms which are spread over and beautify the surface of the globe. Land, water, air, could not for a single instant exist, as they do, in its absence; all would suddenly fall into one rude formless mass—solid and impenetrable. Heat is the parent and the nurse of the endless beauties of organisation; the mineral, the vegetable, the animal kingdom are its offspring. Every natural structure is either immediately produced by its agency, maintained by its influence, or intimately dependent on it. Withdraw heat, and instantly all life, motion, form, and beauty will cease to exist, and it may be literally said—"chaos is come again."—p. 2.

This is by no means the only eloquent and convincing passage by which Dr. Lardner justifies his determination of devoting

* Treatise on Heat. By the Rev. Dionysius Lardner, LL. D., F. R. S. 1832. Longman and Co. Small 8vo. pp. 429; forming vol. 39 of the Cabinet Cyclopædia.

a whole volume of the scientific series of his Cyclopædia to the subject. He shows that, without a knowledge of the properties of heat, the observations of the astronomer would be incorrect, and the experiments of the chemist inconclusive. Then, warming as he proceeds, he inquires—

"But why repair to the observatory of the astronomer, or to the laboratory of the chemist, for examples of a principle which is in never-ceasing operation around us? Sleeping or waking, at home or abroad, by night or by day, at rest or in motion, in the country or in the town, traversing the burning limits of the tropics, or exploring the regions of the Pole, we are ever under its influence. We are at once its slaves and its masters.

"We are its slaves. Without it we cannot for a moment live. Without its well-regulated quantity, we cannot for a moment enjoy life. It rules our pleasures and our pains; it lays us on the sick bed, and raises us from it. It is our disease, and our physician. In the ardour of summer, we languish under its excess, and in the rigour of winter we shiver under its defect. Does it accumulate around us in undue quantity, we burn with fever. Does it depart from us with undue rapidity, we shake with ague, or writhe under the pains of rheumatism, and the tribe of maladies which it leaves behind when it quits us.

"We are its masters. We subdue it to our will, and dispose it to our purposes. Amid arctic snows we *confine it* around our persons, and prevent its escape by a clothing impervious to it. Under a tropical sun, we *exclude it* by like means. We extort it from water, to obtain the luxury of ice in hot seasons; and we force it into water, to warm our apartments in cold ones. Do we traverse the seas? It lends wings to the ship, and bids defiance to the natural opponents, the winds and the tides. Do we traverse the land? It is harnessed to the chariot, and we outstrip the flight of the swiftest bird, and equal the fury of the tempest.

"If we sleep,—our chamber and our couch are furnished with contrivances for its due regulation. If we eat,—our food owes its savour and its nutriment to heat. From this the fruit receives its ripeness, and by this the viands of the table are fitted for our use. The grateful infusion which furnishes our morning repast, might remain for ever hidden in the leaf of the tree, the berry of the plant, or the kernel of the nut, if heat did not lend its power to extract them. The beverage that warms and cheers us when relaxed by labour, or overcome by fatigue, is distilled, brewed, and fermented by the agency of heat. The productions of nature give up their sanative principles to this all-powerful agent; and hence the decoction, or the pill, is produced to restore health to the sinking patient.

"When the sun hides his face, and the heavens are veiled in darkness, whence do we obtain light? Heat confers light upon air, and the taper burns, and the lamp blazes, producing artificial day, guiding us in the pursuits of business or pleasure, and thus adding to the sum of life by rendering hours pleasant and useful which must otherwise have been lost in torpor or in sleep."—p. 5.

This view of the services of Heat to man is certainly most striking; yet it is not at all overcharged, if we except, perhaps, one instance, in which human invention has not yet turned the agency of Heat to quite so great an advantage as Dr. Lardner tells us it has done. Heat has, indeed, been "harnessed to the chariot;" but we have not been able, by its efforts, to equal the fury of the tempest! In a curious matter-of-fact note to this passage, Dr. L. calculates the rapidity of wind in a storm at forty miles an hour, and asserts that the like speed has been attained by steam-carriages on common roads! This is a mistake. There is, we believe, an apocryphal story extant, of a steam-drag running at something like that rate *for a few minutes together, and down hill*, but only about one-fourth the distance has ever been fairly done *in an hour*. Perhaps Dr. Lardner drew his information from the witness before the House of Commons, who was made in the Report to state that *his* carriage had travelled at the rate of thirty miles an hour "for four *hours* and a half together," and never saw the correction of the unlucky error of the press—"for *hours*, read *miles*." It would have been as well if this exaggerated paragraph had been omitted altogether; but Dr. Lardner too dearly loves to give his Cyclopædia an appearance of spick-and-span novelty, to let slip an opportunity of introducing an allusion, however incorrect, to any invention of yesterday, crude and undigested as it may be.

There is not so much in the Treatise, of the practical applications of Heat as the advertisements (although not the title-page) might lead the reader to expect. Indeed how, in one small volume, could

a thousandth part of those almost innumerable applications be more than alluded to? What illustrations from these sources there are, are chiefly drawn from those processes glanced at in the following passage of the Introduction:—

"It presents advantages which merit peculiar consideration in a work designed for popular uses. The phenomena all admit of being explained without the aid of abstruse reasoning, technical language, or mathematical symbols. The subject abounds in examples of the most felicitous processes of induction, from which the general reader may obtain a view of that beautiful logic, the light of which Bacon first let in on the obscurity in which he found physics involved. And, finally, the whole range of our *domestic experience* presents a series of familiar and pointed illustrations of the principles to which it leads."—p. 7.

Thus, after explaining the theory of radiation, a variety of familiar examples of its influence are given:—

"Vessels intended to contain a liquid at a higher temperature than the surrounding medium, and to keep that liquid as long as possible at the higher temperature, should be constructed of materials which are the worst radiators of heat. Thus tea-urns and tea-pots are best adapted for their purpose when constructed of polished metal; and worst when constructed of black porcelain. A black porcelain tea-pot is the worst conceivable material for that vessel, for both its material and colour are good radiators of heat, and the liquid contained in it cools with the greatest possible rapidity. On the other hand, a bright metal tea-pot is best adapted for the purpose, because it is the worst radiator of heat, and therefore cools as slowly as possible. A polished silver or brass tea-urn is better adapted to retain the heat of the water than one of a dull brown colour, such as is most commonly used.

"A tin kettle retains the heat of water boiled in it more effectually if it be kept clean and polished than if it be allowed to collect the smoke and soot, to which it is exposed from the action of the fire. When coated with this its surface becomes rough and black, and is a powerful radiator of heat.

"A set of polished fire-irons may remain for a long time in front of a hot fire without receiving from it any increase of temperature beyond that of the chamber, because the heat radiated by the fire is all reflected by the polished surface of the irons, and more of it is absorbed; but if a set of rough, unpolished irons were similarly placed, they would speedily become hot, so that they could not be used without inconvenience. The polish of fire-irons is, therefore, not merely a matter of ornament, but of use and convenience.

"A metal helmet and cuirass, worn by some of our regiments of cavalry, is a cooler dress than might be at first imagined. The polished metal being a nearly perfect reflector of heat, throws off the rays of the sun, and is incapable of being raised to an inconvenient temperature. Its temperature is much less increased by the influence of the sun than that of common clothing. The polished surfaces of different parts of the steam-engine, especially of the cylinder, is not matter of mere ornament, but of essential utility. A rough metal surface would be a much better radiator of heat than the polished surfaces, and if rust were collected on it, its radiating power would be still further increased, and the steam contained in it would be more exposed to condensation by loss of heat."—p. 324.

Illustrations of this character certainly bring science "home to every fireside," and should not, therefore, be omitted; but in a Treatise on Heat, and its practical applications, it is but natural to look for more examples drawn from the various manufacturing processes, in which its use is so important and so universal, than our author has given us. In that case, however, he must have enlarged his limits: his present bounds would hardly be sufficient to contain the illustrations to one chapter alone—for instance, that on "vaporisation;" for how could any idea of the multitudinous methods of employing the power of STEAM be given in a less compass?

The chapters on Radiation and Evaporation are the richest in apposite examples, except that on the "Sensation of Heat," which is, perhaps, the most interesting of the whole, and presents, in style and manner, a very excellent imitation of that part of Sir John Herschel's celebrated Introduction to the Study of Natural Philosophy, which treats of the illusions of the senses. The whole work consists of eighteen chapters, and an Appendix of very useful and valuable Tables. Altogether, we think Dr. Lardner must be allowed to have produced, in this instance, a volume which will do honour to his Cyclopædia. If it has defects, let it be remembered that, as far as we are

aware, it is the first separate and complete treatise on Heat which has appeared, and that, therefore, the author had not the labours of predecessors to guide and assist him in his novel task.

Mechanics' Institutions.—"Your remarks on the London Mechanics' Institution were wanted; they seem every where to be becoming Institutions for the middle, instead of the working classes, and consequently useless for their intended purposes. The North London appears to have got altogether into that way; and down at Liverpool matters are still worse, where, for one lecture on any thing of a practically scientific character, they are treated with fifty on the Belles Lettres. Mechanics' Institutions must be exclusively confined to the mechanical classes, or their anticipated effects will be looked for in vain. Still, however, I do not see why you should make such a set against poor Dr. Birkbeck; he seems a well-intentioned man, and is not, I presume, to blame that the experiment has not turned out better." H.—The reason why we find fault with Dr. Birkbeck is simply this, that he has, from motives of a most self-interested character, contributed more than any other individual to that *concealment of the truth*, with respect to the London Mechanics' Institution, of which we have so often complained. It would suit neither Dr. Birkbeck's vanity nor purse to have it known that, as a *Mechanics'* Institution, it is a lamentable failure; and therefore it is that we see it year after year represented, in defiance of all truth, as having succeeded to admiration! We desire no better justification of all we have advanced on this head than what would be furnished by a statement of the actual number of working mechanics who have belonged to the Institution during each year since its establishment; and we again challenge Dr. Birkbeck and his Committee to offer a single good reason for not laying such a statement before the public. A false friend to a cause does commonly a great deal more harm than an open enemy. Were it only made as officially and publicly known as it ought to be, (and but for the vanity of one man, would be,) that the mechanics of the metropolis have ceased to support the Institution established for their benefit, the friends of knowledge might then be induced to commence a serious inquiry into the causes of their estrangement, and to do their best to remove them. Individual pride would probably be humbled by the result; but the good of the community at large, and of the working classes in particular, would be assuredly promoted.—ED. M. M.

The Paddington Society for Advising the Poor (as to the best way of managing their domestic affairs!) is a public impertinence, which does not deserve the formal castigation which our correspondent R. would bestow upon it. The poor do not need to be told how to view the intrusion of such Paul Pry philanthropists.

Forcing Oak Trees.—It appears from a number of experiments which have been made by W. Withers, Esq., of Norfolk, and are detailed in a letter from him to Sir Henry Stewart, Bart., not only that "fast growing timber is superior in quality to that of slower growth, but that by the constant application of manure to the roots of trees, planted even in good soil, nearly double the quantity of timber may be obtained in the same period, while its strength, instead of being diminished, will be thereby increased."

Seeing through Comets.—Sir John Herschel states, in a paper communicated to the Royal Astronomical Society, that on the evening of the 2[?]d of September last, he saw a whole cluster of stars of the sixteenth magnitude, almost through the very centre of Biela's comet (the one that lately approached so near the earth), the light of which, according to Sir John, could not have passed through less than fifty thousand miles of the matter of the comet.

English Roads paved with East Indian Materials.—It is a singular fact that the first mile of road from Shoreditch to Newington has been for some time past repaired with the black porphyry stone, brought from China as ballast in the tea ships (considered by Mr. Telford to be the "best of all road materials"), and that the next half mile has been repaired with granite from Bombay.

Menai Bridge.—We are glad to perceive, from the Ninth Report of the Commissioners for the improvement of the road from London to Holyhead, that the Menai Suspension Bridge continues, after a lapse of six years, in a most perfect state in every respect. During all this time it has cost nothing, except for painting, lighting, and watching, and keeping the roadway in order.

New Polish.—The following is a simple method of making available, for purposes of art, the polish which nature presents in some solid metals. The polish of a clean surface of an alloy of melted tin and lead is very beautiful. Suppose it to be desired to fix this upon a tube of copper or iron, or upon the iron spouts attached to tea kettles of tin. The tube is, if of copper, to be prepared in the usual way, and if of iron, to be well tinned. Dip the tube into a vessel of melted alloy of tin and lead, and allow it to remain until thoroughly heated. On withdrawing the tube the liquid metal runs down the surface. Pour rapidly *into* the tube cold water. The metal will immediately fix on the outer surface, retaining the polish which it had when liquid.—*Isaiah Lukens—Franklin Journal.*

INTERIM NOTICES.

A friend of Mr. Baddeley, who is afraid it may be inferred that he has been silenced by Mr. Shalders' letter, requests we will state that, ever since the week previous to its appearance, Mr. Baddeley has been absent from London on a distant travelling excursion, and will, in all probability, not see the letter till his return to town.

Our reply to "Animo" is in type, but unavoidably deferred, from want of room, till next week.

By an error of the press, one of our correspondents was *unsexed* last week; but we hope the request we addressed to *him* has not on that account been overlooked.

C. (with some necessary modifications) shall have an early place.

Compliance with D. T.'s request would be m de a ground for so many similar requests, which we should not know how to refuse, that we are obliged to adhere to the general rule we have laid down—to insert nothing in the body of our work which is merely of the nature of an advertisement.

Communications received from A Carriage-maker—Mr. Williams—J. C.—Mercator—Juvenis—Hywain—Enterprise.

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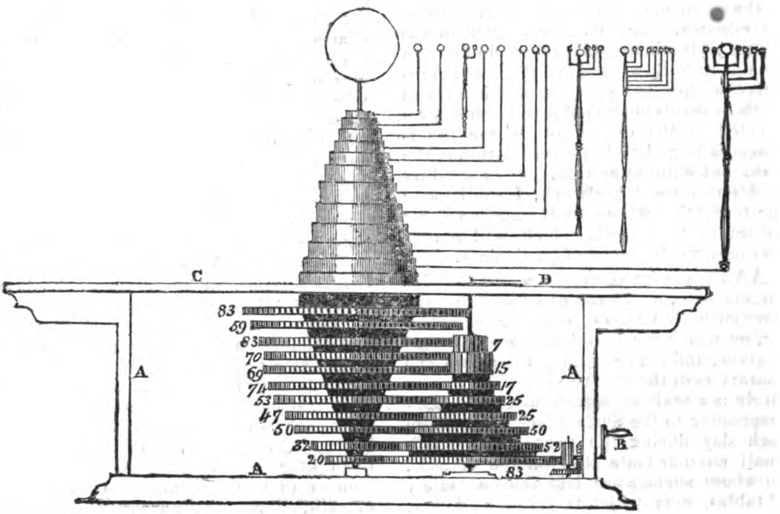
MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 500.] SATURDAY, MARCH 9, 1833. [Price 3*d*.

HENDERSON'S PLANETARIUM.



SWING FRAME FOR CHEESES.

Fig. 1.

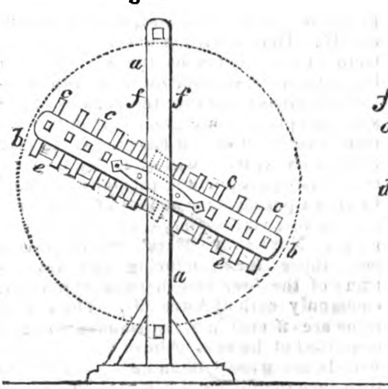
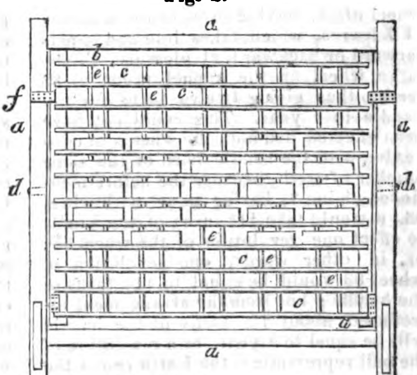


Fig. 2.



HENDERSON'S PLANETARIUM.

Sir,—The subject of the present communication is a drawing in section of a planetarium, which I have had constructed about four years, for showing (as nearly as possible with single wheelwork) the mean motions of all the planets round the sun. The wheelwork somewhat resembles two conical layers of wheels, with the apex of the one turned against the base of the other. The cone of wheelwork adjacent to the handle B is fixed immoveably on a solid axis, and turns all round with it in the assumed period of 365 days, 5 hours, 49 minutes. The wheels placed in the centre of the instrument are made fast to a system of hollow axes or tubes, which revolve within one another, the innermost of them revolving round a solid steel stem erected in the centre, on whose top is placed a large ball in representation of the Sun, but without motion. In proceeding to describe the wheelwork, I shall name the respective wheels by the numerals that belong to their teeth, which will render less tedious the detail of particulars.

AAA is the frame or box which contains the machine, on the top of which is a large circular plate CD, representing the ecliptic, on which are laid down two scales of degrees, and between them the names and characters of the twelve signs. The outer circle is a scale of months and days, corresponding to the Sun's place at noon, in each day during the year. There is a small circular plate at D on the ecliptic, on whose surface are laid down a variety of tables, over which traverses an index, fixed to the annual arbor, which, by moving round them, points to a variety of useful requisites, worthy to be remarked. B is the handle, on whose axis is made fast a wheel, a little bevelled, of 24 teeth, which takes into the teeth of a similar wheel of 25, having in its centre a pinion of 7 leaves, which takes into and impels forward or backward, at pleasure, C, the large wheel on the annual arbor of 83 teeth; thus giving twelve turns for the handle in a year. This could not have been effected had both the wheels in connexion with the handle been of the same number of teeth, because the before-mentioned pinion 7, having to act with wheel 83, it would take $11\frac{6}{7}$ turns of the handle to effect one revolution of the wheel 83; or, in other words, one revolution of wheel 83 would be equal to $11\frac{6}{7}$ turns of the handle; but from the arrangement introduced, about $12\frac{1}{3}$ turns of the handle will be equal to a year, or a revolution of the ball representing the Earth round the Sun.

It has been stated that the cone of wheels toward the right are all fast to a yearly arbor. I will, therefore, now show how the wheels are affected by the motions of each other. The large wheel of 83 teeth takes into and turns round the undermost wheel in the system of tubes, and containing 20 teeth, which is caused to accomplish its revolution in 88 days, 0 hours, 14 minutes; for as 83 is to 365·242, so is 20 to the period of Mercury's revolution. The tube of Mercury's wheel, as has been before noticed, revolves on the solid stem supporting the ball in representation of the Sun, and ascends within a little of it, bearing a wire bent at right angles, which sustains a small ball on its top, to denote Mercury. Above wheels 83 and 20 are wheels 52 and 32, wheel 52 being on the annual arbor, and 32 on its tube in the centre, which revolves with great exactness on its fellow, as does also all of those above. As 52 is equal to a year, 32 must of necessity move so much quicker, and therefore accomplishes its period in less time, for as 52 is to 365·242 days, so is 32 to the period of Venus. By this calculation it will be found to consist of 226 days, 18 hours, 29 minutes. The tube of wheel 32 ascends near to the top of Mercury, and supports a wire bent at right angles with a small ball placed on its top, in representation of Venus. Above each of the two last-named wheels are two of 50 teeth each, for 50 on the annual arbor, going round in a year, must take into the teeth of a wheel of the same size and number of teeth, no matter what number of teeth, provided they are of the same size and number. The tube of 50 in the centre ascends to near the top of Venus, bearing its wire, sustaining 2 small balls in representation of the Earth and her satellite the Moon, but without motion. Above these wheels of 50 are the train for the period of the planet Mars, and wheels 25 and 47. Here it will be observed, that the teeth in the wheels on the annual arbor begin to diminish, and in those in the centre to increase, because the periods of the superior planets are greater than the annual revolution of the Earth. If 25 give 365·242 days, what will 47? By the common rule of proportion, this will be found to give a period near to that of the period sought for, viz. 686 days, 16 hours, 5 minutes. Next above Mars' pair of wheels are those for producing the revolutions of the four last-discovered planets, commonly called Asteroids. Their motions are effected in a similar manner as is described of the rest. Above Mars' train of wheels are wheels 16 and 58. If 16 teeth turn once round 365·242, wheel 58 will ac-

complish its revolution in 1324 days, 0 hours, 41 minutes, being the period of Vesta. Above these last-named wheels are those numbered 17 and 74, when 17 turning once round in a year will cause 74 to effect a revolution in 1589 days, 21 hours, 53 minutes, being the period of Juno (nearly). Next above are wheels 69 and 70, both driven by the thick pinion of 15 leaves on the annual axis. Their motions or periods of time arising therefrom are as follows:—Wheel 69 and its tube will turn once round in 1680 days, 3 hours, 31 minutes, nearly the period of Ceres. The periods of Ceres and Pallas being nearly of the same nature, are generally taken together in calculation; but to give Pallas a motion, I have given an additional tooth to the wheel bearing the representation of that planet, which thereby effects its period in 1704 days, 3 hours, 37 minutes. On the top of the annual arbor is a pinion of 7 leaves, which turns the large wheel 83 round in the period of Jupiter nearly; thus $7 : 365{\cdot}242 :: 83 =$ 4330 days, 19 hours, 40 minutes. Wheel 83, revolving on the tube of Pallas, carries as the rest a wire, bearing on its top a ball, surrounded by four lesser ones as satellites.

The motion of the two upper wheels in the centre, and containing respectively 59 and 84 teeth, now remains to be described; and in doing so, the reader must endeavour to find his way by conceiving the following arrangement, which is purposely omitted in the section, in order that what has been described might be the better understood. Two wheels of 50 teeth each are placed in a lateral situation with, and driven by the wheel of the same size and number on the annual arbor, and therefore turn round, but in a contrary direction, with it once in a year. The axes of these wheels ascend and turn in the upper frames, in the same way as the annual arbor. The wheel, communicating motion to Jupiter, has made fast to the top of its arbor, a wheel of the same size and number of teeth, which drives one of 25 teeth in a horizontal position, whose axis is in part an endless screw, which takes into and turns wheels 59 once round in 29½ years, or 10,768 days, 22 hours, 58 minutes; for wheel 50 turns once round in a year, and turning wheel 25, this wheel must have its motion doubled, and therefore half wheel 59. On the axis of the other wheel of 50 teeth, is a wheel of a similar number, turning another, of the same size and number, once round in a year. This last-mentioned wheel's axis lies in a horizontal position to, and drives wheel 84, turning it a tooth in the direction of the planet's motion per annum, or turning the wheel once round in 84 solar years, or 30,660 days, 19 hours, 11 minutes. Saturn and his ring, and seven satellites, are carried round the central ball in the period produced by the wheel-work; and the planet Herschell, and his six moons or satellites, in the period mentioned.

For greater exactness in the planetary periods, recourse must be had to fractions of a higher value, which must of necessity occasion a great assemblage of wheels for the period of a single planet. I calculated wheel-work for a planetarium some years ago, which did not cause an error of above 17 seconds for the greatest period, and 11 thirds for the least period; but had this machine been made it would have contained 173 wheels. The one here described is the model of one which I completed in 1828, and answers all the purposes for which it was intended extremely well. Persons wishing to have models of such a planetarium, can have them from a friend of mine, by application to me, for £5 10s.

I will, in conclusion, give one illustration of how the wheelwork of a planetarium may be calculated; and, for the sake of easy explanation, will suppose 8766 hours to be the period of the Earth's revolution, and 2111 that of Mercury. Now, were a wheel large enough to contain 8766 teeth, to drive another containing 2111 teeth, this last-mentioned wheel would complete its revolution just in as many hours as there are teeth in the wheel, and the numbers 83 and 20, which I take are just an approximation to the value of $\frac{8766}{2111}$ in a reduced state, which may be found thus, $8766 \div 2111 = 4 \cdot 15$, that is, whatever wheel is pitched for Mercury, that wheel must contain 4·15 more teeth than in the present instance. I have taken 20 as Mercury wheel: multiply this by 4·15, there will arise the number 83, being the driver for wheel 20, and therefore constituting Mercury's train. The same example applies to all, but in reversed order as the period increases. I shall, perhaps, resume my pen at some future period, to give you a description of wheelwork for the production of astronomical machinery, should the present article be found of the least service to any of your numerous readers.

I am, Sir,
Your obedient servant,
E. Henderson.

96, Duke-street, Liverpool,
June 18, 1832.

P. S.—I subjoin, for the sake of easier

reference, a table of the wheelwork and periods arising therefrom in the planetarium before described.

	Days.	Ho.	Min.
$83\times 20=$	88	6	14
$52\times 32=$	224	18	19
$50\times 50=$	365	5	49
$25\times 47=$	686	16	5
$16\times 58=$	1324	0	41
$17\times 74=$	1589	21	53
15×69 }	1680	3	31
74 }	1704	3	37
$7\times 83=$	4330	19	40
$1=\frac{50}{25}\ 59=$	1·10768	22	58
$1=\frac{50}{50}\ \frac{50}{50}=$	1·30660	19	10

SWING FRAME FOR CHEESES.

New cheese requires to be hardened considerably by gradually drying before it becomes fit for market. For this purpose the cheeses are spread in a single layer on the floor of the cheese-room, and are turned by hand every day, in order to expose each surface alternately to the air. This, on a large dairy farm, is a slow and laborious operation, which, as it devolves on the female servants, sometimes prevents them, in the hurry of business, from paying proper attention to keeping every implement used in the dairy in that degree of order and absolute cleanliness so essential to the good quality of the produce. Another objection to the common method is, that the floor on which the new cheeses are laid soon becomes penetrated with moisture, so that the benefit which each surface of a cheese in succession gains by exposure to air, is in part lost by being placed the next day in contact with the damp floor.

A machine, of very simple construction, has been recently contrived by Mr. Blurton, of Field Hall, near Uttoxeter, by which these objections are not only completely removed, but the process of drying amazingly accelerated. We extract our present account of it from the last part of the *Transactions of the Society of Arts*, who have conferred their large silver medal on Mr. Blurton for the invention.

The machine consists of a dozen strong shelves framed together, and having bars nailed from top to bottom of one side, in order to prevent the cheeses from falling out while in the act of turning. The frame is suspended on two strong pivots, one of which is let into the wall of the room, and the other is supported by a strong post. Two catches keep the frame upright, and prevent it from being turned more than half round. By first filling the shelf immediately below the axis of the frame, and then placing the cheeses alternately on the two nearest shelves above and below that which has been already filled, the preponderance of one side over the other can never be more than the weight of one cheese; the whole power, therefore, required to turn the machine cannot, in any circumstances, be greater than this and the friction of the pivots. The cheeses, in the act of turning, drop on those shelves which, in the former position of the frame, were above them, and, having been exposed to a current of air for twenty-four hours previous, have become perfectly dry.

Mr. Blurton has had the machine in use for five or six years, and finds that, by means of it, fifty-five cheeses are turned in the same time which is required for turning two by hand. Three other advantages attend its use: First, that a room thus furnished will hold thrice as many cheeses as when they are laid on the floor. Secondly, that the shade afforded by the shelves, together with the current of air which passes between them, has the effect, in hot weather, of preventing excessive sweating, and consequently loss both in weight and quality, as well as diminishing the necessity of rubbing the cheeses. Thirdly, the ripening of the cheeses is hastened, so that on an average they are ready for market five weeks earlier than usual.

The figs. 1 and 2, on our front page, represent a front and an end view of the model in the Society's possession, which differs from the real machine in the circumstance that one of the uprights of the exterior frame *a a a a* is replaced by the wall of the cheese-room; *b b* are two strong bars forming the uprights of the inner or swinging frame; *ccc*, &c. shelves of any convenient even number, half being above and half below the axis or pivots *dd*; *ee*, bars nailed in pairs on one side of the shelves, to prevent the cheeses from falling out in the act of being turned; *f f*, bolts to keep the frame in an upright position.

WINES AND SPIRITS.

Sir,—I am equally averse to being a member of a "Temperance Society" as

I am of a "Drinking Club;" because I think the prohibitions of the former would operate as a temptation quite as forcibly as the unrestricted license of the latter. Indeed, when I recollect how ineffective prohibitions are, in the ordinary transactions of the world, I fear that the shortest course by which many may become drunkards, is by enjoining on them perpetual abstinence from spirits. I am thankful to say that I am habitually a temperate man. The little I do drink, however, whether it be wine or spirit, I like to have good. There is no difficulty in obtaining good, and wholesome, and genuine articles, of almost every kind, if we exercise a little discrimination in making choice of the persons with whom we deal. It is important that we should not only examine into their terms and prices, but also, as far as is practicable, their private character, habits of life, and abilities as tradesmen.

Cheap articles, commonly so called, are merely low-priced — they are not cheap. It would be well, however, if inferiority were the only defect of those articles which we see advertised every day at astonishingly low prices. Generally speaking, they are the products of a widely extended system of fraud and adulteration, and in some cases, with shame be it said—they are the result of many of the most ingenious applications of scientific knowledge; knowledge which would confer honour on its possessor if it were employed for a beneficial purpose; but which is a disgrace and a curse whilst applied to a deleterious process.

It cannot have escaped the observation of those who take the trouble to think for themselves, that among a certain portion of the wine and spirit trade, a system of fraud, if not of adulteration, has for many years prevailed. Much has, at various times, and by different persons, been written with a view to expose these nefarious practices, and in the hope that, by exposing them, they may diminish their frequency. I have good reason to believe that the publications to which I allude have had a contrary effect. I have now before me one work,* which is eminently calculated to impart the very kind of information that would be most useful to the uninitiated. It is a complete text book for unprincipled wine-merchants and gin-shop-keepers; and I can easily imagine that it abounds with hints which many had anxiously sought after elsewhere, but of which they at length eagerly availed themselves, and now secretly act upon.

If, by carefully conducted chemical analysis, by the accidental discovery of private memoranda, or by oral testimony on which we can depend, it can be satisfactorily ascertained that certain ingredients are employed, for a certain purpose, in the management or manufacture of articles of daily consumption, should it not be a matter for serious consideration whether the publication of the secret is likely to be attended with good or evil? Putting the public on its guard against such impositions is a fine-sounding argument, but it is intrinsically worth nothing. Give to the statement the utmost degree of publicity of which it is susceptible, and yet the first person who reads it may be the unconscious victim of the very species of trickery he is instructed to guard himself against.

Take gin, for instance, the adulterations of which are so manifest, and their announcement so barefaced, that they no longer excite attention: and how very, very few are there, who ever think of applying to gin a chemical test, by which to ascertain its purity? But if there are few who *think* of doing this, is not the number much less of those who possess the means and the ability to perform the experiment aright?

Why, therefore, awaken suspicion and create distrust in the public mind against the MANY who yield to no class in the commercial world for respectability and integrity, and mental attainments, merely for the sake of being revenged on the FEW who live by lying and deceit? There are hundreds of wine-merchants in this kingdom who would cast from them with disdain, the slightest imputation of possessing even a knowledge of the iniquitous practices adopted by others.

If the exposure of such practices were in any way calculated to abate them, I would say let the particulars be inscribed on the corner of every street; but since, as I have before stated, it has manifestly a contrary tendency, some other means should be devised which are less objectionable.

With your permission, Sir, I should

* I abstain from quoting the title of the work. It was published in 1827, I believe with a good intention—but a sad deficiency of discernment.

like to send you an occasional paper on wines and spirits. My sole object will be to impart such information as, I conceive, will be generally useful to every class of your readers. It will relate chiefly to the qualities and prices, the most economical mode of purchasing, and the most simple plan for managing the wines and spirits which are commonly in request in this country.

I would have it clearly understood that I have no important secrets to disclose, no private feelings of jealousy to gratify, and no personal annoyances to resent. It will be my concern boldly to attack, and unceasingly to expose, not men, but their practices. I have nothing to do with private character: that must be viewed as sacred. With the public conduct of private individuals, however, it is far otherwise: that is a species of public property, and is a fair subject of examination.

I live far removed from the influence of lying advertisements, and the persons who resort to that species of quackery; and, therefore, in giving evidence in this case, I trust I shall be considered a disinterested witness. To undeceive the few who may take the trouble to read my papers on a subject that stands intimately connected with their health, their purses, and their principles, is all that I desire. If I succeed in only *one* instance, I shall be satisfied with that reward to my labour.

IN VINO VERITAS.

February 16, 1833.

THE MONSTER MORTAR OF ANTWERP.

The following particulars respecting the gigantic mortar employed at the late siege of Antwerp are gleaned from an account of that siege which occupies nearly the whole of the last Number of the *United Service Journal*, and which, for the circumstantiality and completeness of its details, does infinite credit to the conductors of that able and very useful periodical.

The idea of constructing a mortar of such a magnitude originated with the celebrated Colonel Paixhans, of the French artillery. It was cast at the Royal Foundery at Liege, under the direction of Baron Evain, the Belgian Minister of War. It is 4 feet 11 inches long, is 39½ inches in diameter, and 24½ inches in the bore, and weighs 14,700 lbs. The weight of the empty shell is 916 lbs.; of the powder contained in the shell, 99 lbs.; of the shell, when full charged, 1015 lbs. The powder-chamber is made to hold 30 lbs.; but, as will be afterwards seen, a considerably less quantity than this suffices to discharge the shell when the range does not exceed 800 or 900 yards. The weight of the wooden bed which contains the mortar is 16,000 lbs.

Fig. 1 is a section of the mortar; and fig. 2 another of the shell, with the charge and fuse.

Fig. 1.

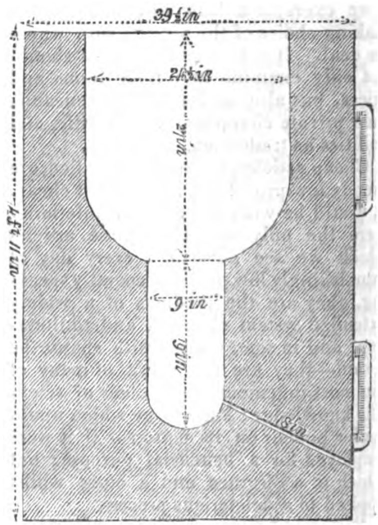


Fig. 2.

The name of "Monster Mortar" was well selected, for it is scarcely possible to conceive a more ugly or unwieldy implement. With the exception of the mortar at Moscow, the bore of which is 36 inches in diameter, and which, if ever used, must have been employed for pro-

jecting masses of granite, the "Monster Mortar" exceeds in magnitude any other engine of the kind hitherto known. The immense pieces called *Karthauns*, which were common on the Continent in the early part of the 18th century, rarely exceeded between 70 and 80 cwt., and projected a ball of not more than 60lbs. weight.*

It was conveyed from the foundry at Liege, on a carriage made for the purpose, to the heath of Braeschaet, near Antwerp, where it arrived on the 17th of December. On the day after, a preliminary trial of it took place in the presence of a number of French and Belgian officers. Previous experiments made with it at Liege had not succeeded, either owing to some defect in the shell, or in the mode of firing. It had been tried with the usual wooden sabot as well as with a wad of twisted straw, but, with one or two exceptions, the projectile burst at the moment of quitting the piece. This was attributed to a want of thickness in the shell, particularly of the culot, or part coming in contact with the charge, which, from the great diameter of the cavity, had not sufficient thickness to resist the shock of the powder and concussion of the air. Fresh shells were directed to be cast, in the proportion shown in fig. 2. Eight or ten experiments were first made with the dead shell, filled with its proper weight in sand, and fired with various charges, from 6 to 12lbs., gradually increasing. No accident occurred. The artillery officers being satisfied with these trials, the shell was loaded to a third, and so on to its full charge, upwards of a barrel and a quarter. Only one shell out of six burst at the mouth of the piece; the remainder fell near the target and exploded with a fierce detonation, tearing up many cubic feet of earth and scattering splinters to the distance of 450 yards. The shells were hoisted to a level with the mouth of the cylinder by means of a chevalet (tressel), supporting a swivel-bar, on the one end of which were suspended two chains with hooks to catch the rings of the shell, and on the other a weight nearly equalling that of the projectile; it was easily raised by this means, and then lowered, without any jar, into the chamber. A straw-twisted wad was employed as a sabot. The operation of loading required on an average from 37 to 50 minutes. The vent was fitted with a spring detonator, and the man who fired stood behind a traverse and pulled the string with a long cord.

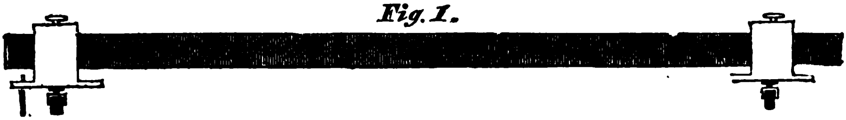
The efficiency of the mortar having been thus satisfactorily determined, it was resolved to convey it into Antwerp, and to place it in battery against the citadel. Eight horses were required to draw the carriage on which it was placed, and eight others to draw the carriage containing the bed. The station selected for the mortar was close by the Malines gate, and within 800 yards of the Fernando bastion of the citadel.

At midnight of the 21st and 22d, the mortar was loaded with 12½lbs. of powder, and the first discharge took place. The shell was watched with extreme anxiety as it made its parabola, and a look-out person, stationed on the tower of St. Andre (in the city), reported that it had fallen and exploded near the great powder-magazine, at the gorge of the bastion Fernando. At the second shot, which took place nearly an hour later, the shell burst on issuing from the mouth of the mortar, not by explosion of the fuse, but from the weakness of the projectile itself. Great care was, therefore, ordered to be taken to select others with thicker culots. The mortar was fired at intervals during the following day, and the shell was then easily to be traced in its progress from the mouth of the mortar. In the air it had the appearance of a huge cricket-ball, and seemed to have but little velocity. On the 23d, General Chassé capitulated, and there was, fortunately, no farther occasion for the use of this tremendous instrument of destruction.

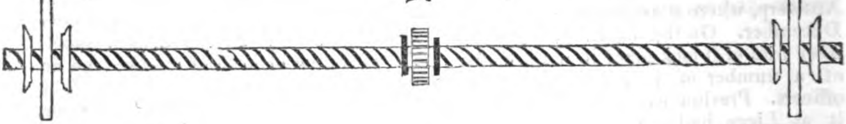
* One of these machines, christened the "Foul Wench," was mounted on the rampart of the water-gate at Dresden when that city was besieged by Frederick of Prussia, in the year 1760. It was the ruin of the houses in the rear, and an object of terror and alarm to all its neighbours; indeed, the commotion and roar which its discharge occasioned were such, that the officer in command was generally compassionate enough to give previous notice of the exact time when it would begin to thunder. The non-militants might be seen and heard running up and down the streets, and shouting "To-day the 'Foul Wench' will be fired three times—at six, at noon, and at seven in the evening." At this signal all the windows were thrown open, and every thing that was brittle was hurried away to some safe corner! Men, women, and children, fell on their knees in prayer, and not a lip would touch food until the "Wench" had done her bidding.—*United Service Journal*, No. LI. p. 238.

INSTRUMENT FOR DESCRIBING SPIRALS, OVALS, AND OTHER CURVED FIGURES, ON A NEW PRINCIPLE.

Fig. 1.



2.



3.

4.

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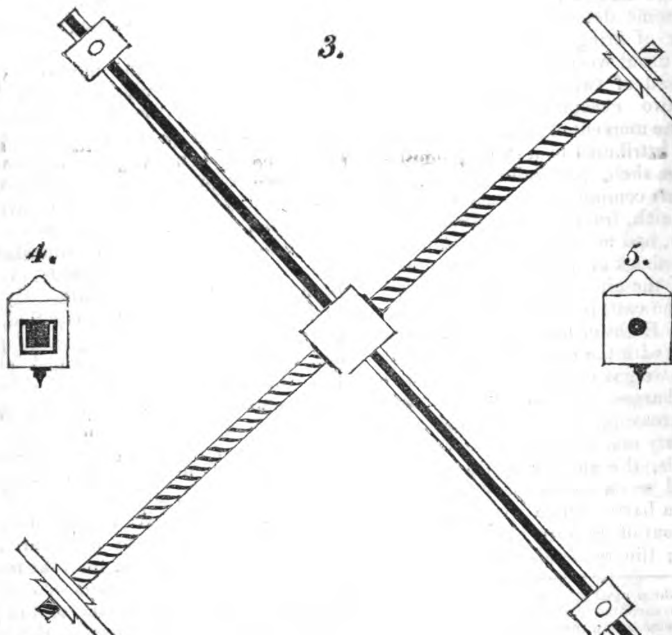
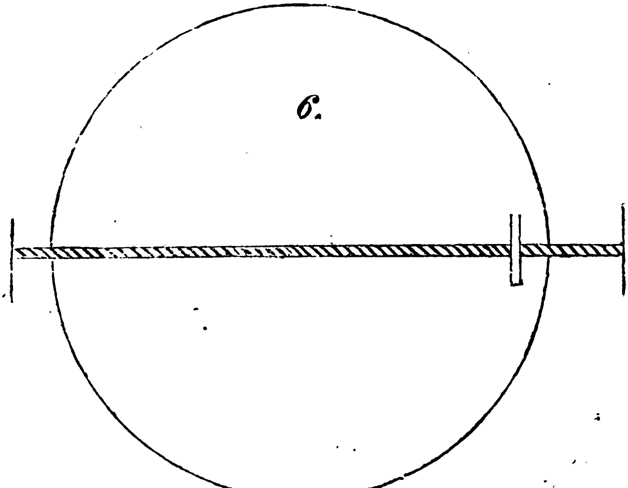


Sir,—The means of describing curve lines have at different times occupied many of the pages of your Magazine, and yet it appears to me that much yet remains to be done towards the satisfactory accomplishment of that object. I think that a perfect instrument for the above purpose, should possess in perfection three qualities, versatility (if I may so appropriate that word), stability, and simplicity. By the first of these I mean the power of manifold adjustment, and of multiplied variety of operation and effect; by the second, I mean a freedom from disturbance or unevenness in the motion; and the third condemns that useless complication of parts to which all wheel engines must be liable. As all the engines exhibited in your Magazine, as far as I have seen, seem chargeable with defects reduceable to one or more of these three heads, I send you the accompanying at-



tempt to supply the defect, on a system, as far as I know, *new*. I must premise, however, that the plan, as you have it, professes only to accomplish spirals of all kinds in the first place; it will also, however, undertake ovals of all dimensions, together with parabolas and hyperbolas. A slight variation of form will enable it produce the involved ovals exhibited by the engines of Messrs. Child and Ibbetson.

Figs. 1 and 2 are the two principal parts of the engine out of their place. Fig. 3 is a downward view of both in place, kept in connexion by a third part, a centrepiece, two side views of which are seen at figs. 4 and 5. Fig. 1 is the tracer beam; it is square and hollow, and has a rack of teeth sunk deep in it. It has at each end a carriage on a castor, and each carriage has a receptacle for a tracer at each of its ends; the tracer is seen in one of these receptacles. Fig. 2 is the motion beam: on its middle is a pinion, intended to work in the rack above mentioned; at each side of the pinion is a working place or shoulder, which enables it to work freely but steadily in the centrepiece. The rest of its length is cut into a screw with a broad square thread. At each end is a roller, fitted to turn freely on the beam, as if it were a plain cylinder, and at each side of each roller is a screw nut; by means of these either roller may be confined so as to revolve on the beam at any certain distance from the centre, or may be clamped so as to compel the beam to revolve with it. The centrepiece is a low square box with a rounded top, and furnished below with a small sharp point, by which the engine is confined to one general centre of motion. The tracer beam passes freely through it, as seen in the section at fig. 4; and above it the motion beam passes at right angles, so as that its pinion may enter the hollow part of the former, and engage the teeth of the rack sunk there. This last is seen in section, fig. 5.

It is by friction that this engine works. To describe a spiral, first adjust a tracer in either carriage, and clamp the carriage at any required position; the other carriage will serve as a friction roller to support the other end of the beam; then set one of the rollers of the motion beam free to revolve, and clamp the other at that position which experience will show to be necessary to produce the required degree of rapidity of curvature in the spires of the spiral: then place one hand on the rounded top of the centerpiece, and applying the other, either to the periphery of the clamped roller, or to a neighbouring part of the motion beam, give pressure and impulse. The roller will revolve by force of its friction with the surface below, and will carry round with it the beam and pinion, and thus the tracer will be compelled to seek or avoid the centre continually, according to the direction in which the roller is driven. As the roller can be clamped at

an infinite number of positions on the motion beam, an infinite number of spirals can thus be produced with their spires all parallel. As endless a variety of spirals can be produced, with their spires having a constantly increasing or constantly diminishing inclination to each other, by having recourse to the motion beam, thus: instead of a roller at one side, put on a screw nut of the same dimensions and form, and let it carry the tracer: set the other roller free as before, and apply its pressure and impulse in the neighbourhood of the nut roller; as it revolves it will acquire a centripetal (and continually diminishing) motion, or a centrifugal (and continually increasing) motion, and thus generate a spiral of continually increasing or continually diminishing rapidity of curvature.

Connected with this I may as well here introduce another novelty (as far as I know) a mechanical paradox. Suppose, as at fig. 6, a circular surface capable of revolving horizontally, a screw fixed across it, over its centre and parallel to its plane, and on the screw a roller nut in close contact with the surface. If the surface be made to revolve, so that the screw nut approach its centre, it may for ever continue to approach, and yet will never reach the centre. If the nut carry a tracer as above, it will describe an *endless spiral*,—another novelty, I believe.

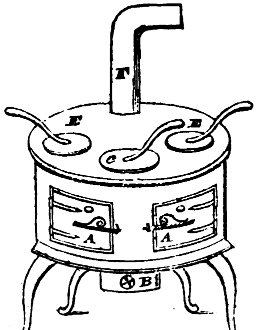
To return to the engine. To trace an oval, the two diameters of the oval must first be drawn, and the point of the centrepiece be placed on their intersection; then adjusting and clamping one of the rollers at the proper position in the motion beam, place the other roller at exactly the same distance from the centre; bring the outer nut up into contact with it, and the inner one so close as only not to impede free revolution. Apply pressure and impulse as before to the clamped roller, and, commencing the motion when the tracer is exactly over one diameter, the transverse suppose, continue until the tracer arrives at the conjugate: now the clamped roller must be released, and the free one clamped, each by its *inner* nut, and, transferring the impelling hand to the newly clamped roller, the motion may be continued. The tracer will revolve in the same direction as before, but its tendency with regard to the centre will be found reversed. When the other extremity of the transverse is arrived at, the old state of things must be restored, and it must be again reversed when the other extremity of the conjugate is come to. Here, again, as the motion roller is capable of an infinite number of adjustments, an infinite variety of ovals results,—a thing which no manageable complication of toothed wheels could effect. I must here beg to revert to the consideration of the spirals. I omitted to state above, that not only can there be produced, by the means of the roller beam, spirals with mutually inclined spires, as above described, but that, by clamping the roller at the other end also of the beam, and applying impulse there too by the hand which was occupied with the centerpiece, the inclination of the spires to each other may be varied at pleasure, and that in this case also the range of variation is infinite.

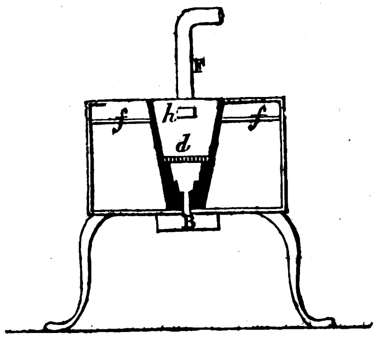
It will require some attention to see how this latter effect is produced; but it will be found, I think, on investigation, that I am right. I should state also, that in calling this latter kind of spiral a novelty, I mean as exhibited mechanically, and on a plain surface; the navigator will, however, recognise in it a relation of the loxodromic spiral described on the surface of a sphere. The novelty consists in this, that one extremity of the spiral is seen in position; that a point is also seen, towards which the spiral is continually tending; but that, nevertheless, it can never reach that point, and that the spiral between the extremity in position and that point will be infinite. It seems also worth the consideration of contrivers of calculating machines, that the two motions generated, as in fig. 6, represent, that of the periphery of the revolving plane, a finite series of regular numbers; and that of the nut roller, to or from the centre, a corresponding and simultaneous infinite series of fluxional numbers. It should also be added, that when this latter kind of spiral is being produced by fig. 3, the pinion of the roller beam should be thrown loose by a contrivance so that the tracer beam shall not be affected. The farther development of the powers of this simple machine I hope some of your more ingenious correspondents may be induced to undertake; it is an interesting subject, but I want time and means to test and improve it by practice.

Φ. μ.

ECONOMICAL COOKERY—COTTAM AND HALLEN'S BRUGES STOVES.

Sir,—You have favoured your readers with a description, extracted from Mr. Loudon's Encyclopedia of Cottage Architecture, part 9, of Mr. Hicks' method of cooking with gas, by which it is stated a leg of mutton was roasted at an expense of 2¼d. Now, in an earlier part (5) of the same excellent work, there is an account given of a cottage cooking stove called the Bruges Stove, which beats this gas affair hollow in point of economy. It is manufactured for the English market by Messrs. Cottam and Hallen, on whose premises I have seen it in use. By this stove a joint of meat was roasted, two good-sized pies were baked, a pudding and two sorts of vegetables were boiled, and sufficient room and heat left to prepare half a dozen sorts of sauces or gravies, all at one and the same time, with an expenditure of 6 lbs. of coke and 2 lbs. of coal, the value of which would not exceed *one penny*. The oven, too, remained in a state to bake any other articles when the pies and meat were withdrawn. Now, Sir, at this rate the cost of roasting a leg of mutton would not exceed *one farthing*; gas, therefore, cannot be recommended on the score of economy, or come at all in competition with it. The economy of this stove exceeds any thing I have yet seen or heard of. It is portable, requires no setting, and may be placed in any apartment where there is a chimney or flue for the reception of the funnel. The following sketches, the one a perspective view, and the other a section, will at once explain the manner of its construction:—





A A are two doors to the oven, which is heated by a conical furnace (*d*) in the centre; this furnace becomes after a time red hot, or at least sufficiently so to furnish heat for roasting. The hot air and smoke pass off from the furnace through the aperture *h*, and are made to circulate round the oven by means of the flue *f f*, after which they escape by the funnel F into the atmosphere or chimney of the room where the stove is placed. The conical shape of the furnace, besides being that which on scientific principles is best suited to combustion, is attended with this advantage, that by having two or three moveable grates, of sizes corresponding to the conical diminution, you can increase or diminish the fire at pleasure. The furnace, as made by Messrs. Cottam and Hallen, has three ledges for this purpose, but this it will be seen is not necessary, and as receptacles for dust they are objectionable. B is the ash drawer, and in the front of this there is an aperture for conveying a stream of fresh air to the furnace. C and E E are saucepans inserted in the top of the oven; the first directly over the fire, and the two others over the smoke flue, *f*. The roasting and baking are done in the space round the furnace.

I am, Sir, yours, &c.,

AN ECONOMIST.

STEAM TRAVELLING ON COMMON ROADS.

"The thing on a common road is impossible; nature and art alike forbid it."

Sir,—These are your own words, as they occur near the conclusion of your notice of Mr. Gordon's "Journal of Locomotion," and after a quotation which appears to be an innocent anticipation of what he hopes to live long enough to see

realised, viz. "As complete a substitution of steam for horse-power on the common roads as we have witnessed in the last half century in the mines, the mills, and throughout the industrial operations of the manufactures of this country." In a former communication on the subject of steam-coaches I endeavoured, on behalf of the inventors, to obtain for them, at the hands of public writers, a portion of that liberal feeling that is generally conceded to men of genius. I now claim of you, in the name of justice and fair dealing, not only on their behalf, but on the part of the public also, to make good the unequivocal assertion above alluded to, that "the thing on a common road is impossible," and that "nature and art alike forbid it." If this were not the honest conviction of your mind, you would not have stated it; and if it is, to a writer of your powers the task cannot be difficult, and could not fail to do you honour, in showing, by the principles involved in your own language, the "impossibility of the thing." You must not flinch here; because no man has morally any right publicly to assert a thing whereby he inflicts injury upon another, unless he can, when called upon, show that the matters he has asserted are true. Now, it is not necessary for me to discuss the injurious tendency of the article in question to persons engaged in these pursuits—"the thing" is manifest; but I entreat you on the part of the public, because many (and myself for one) have already a little interest in "the thing." I have two shares, for which I have given value. Now, if *public writers—scientific men*—boldly assert the thing impossible, what becomes of this little portion of my property and the property of others embarked in these concerns? If "the thing" be fudge, and you have it in your power to prove it to be such, pray do not trifle with us by mere oracular assertions—prove it.

But my claim on the part of the public rests on much more important grounds than this. It is quite plain that improvements such as these can never be carried into effect by the efforts of a single individual; the public are called on to assist, and many are disposed to do so; but seeing or hearing of such statements put forth from such a quarter, they draw back, and the attempted accomplishment of a great enterprise is retarded. Therefore I repeat, that having asserted, in a manner which implies that the point is capable of argumentative demonstration, that which is calculated to do public mischief and private wrong, it would be acting only the part of an honest and upright journalist, in a manly and straightforward manner to state the principles by which you arrived at such an apparently bold conclusion. You have ingenuity enough, I know, to take my rough and hasty scrawl, and, in a vein of humour or sarcasm, to hold it up to ridicule; but I entreat the exercise of your ingenuity on the side of usefulness and truth to solve an interesting, grave, and important question.

ANIMO.

We admit the force of the considerations on which "Animo" grounds his demand upon us, to justify the opinion we have expressed respecting the extent to which steam travelling on common roads is advantageously practicable, and shall now do our best to show that we have abundant reason for all that we have advanced on the subject.

Let us see, then, what "the thing" is which Mr. Gordon anticipates, and which we have declared to be "impossible." It is this—that a time is at hand when a steam-drag, with six or eight private vehicles attached, will start from St. Paul's at six o'clock in the morning, proceed to the Great Park at Windsor, a distance of more than twenty miles, remain there two hours ("an hour and a half to stroll about," and half an hour to "march into the bowels of the dainties,") and return to St. Paul's by ten o'clock; making the distance acomplished by the steam-drag and its train *full twenty miles an hour*.

Now, to enable the reader to judge how far it is reasonable to anticipate any such performance as this from the ordinary employment of steam power on common roads, we shall first show him what those who have had the greatest practical experience of the capabilities of steam-carriages, thought of the matter when lately examined upon it before the House of Commons.

Mr. Gurney being asked, "at what rate do you suppose it would be safe to run steam-carriages on the public roads?" answered, "I have run them safely eighteen and twenty miles an hour, but

twelve miles an hour is perfectly safe and practicable." Although Mr. Gurney here states that he has run them "eighteen and twenty miles an hour," it is to be gathered from the context of his evidence that he meant only at *the rate* of eighteen or twenty miles, for some such short distance as a quarter or half a mile, and under such favourable circumstances as a dead level or down hill; for it does not appear that he ever travelled at that rate for a continuance, not even for one hour at a time; and, in point of fact, the best of all his performances, that from Melksham to Cranford Bridge, a distance of 84 miles, was not accomplished in less than ten hours, being on an average no more than 8½ miles per hour. At all events, we have Mr. Gurney with us to this extent, that twelve miles an hour is *the utmost* we can expect to see realised as an average rate.

Mr. Hancock was asked whether, if "he were to travel one hundred miles in ten hours, he could *keep up that rate* without damage to the machine?" His answer was, "Yes, I reckon the work would be done in eight hours; but the stoppages, and one thing or another, will take up two hours." That is to say, he thinks, with Mr. Gurney, that twelve miles an hour *might* be accomplished, but that, "taking one thing or another" into account, more than *ten* cannot be safely reckoned upon.

Mr. Ogle asserted that he had gone with his carriage "from the turnpike-gate at Southampton to the four-mile stone on the London-road, a continued elevation with one very slight descent, at a rate of 24½ miles an hour, loaded with people." And from this it has been inferred (as any person would naturally infer), that the whole distance was accomplished at that rate, or the four miles in about ten minutes; but when we turn to the evidence of Mr. Ogle's partner, Mr. Summers, who states that he was "always" with the carriage when making experiments, and who is, we believe, the practical man in the affair, we find that in his opinion the "utmost speed" accomplished, on the piece of road abovementioned, was only somewhat "more than 15 miles an hour," (that is, 9½ miles less than stated by Mr. Ogle,) and the "average speed" only "nearly ten miles an hour."

Mr. Ogle has been farther pleased to assert, that on a certain "wet road, with patches of gravel upon it," he obtained a velocity of "between 32 and 35 miles an hour," and that "it *might* have been continued under similar circumstances." *How long* he *did* continue it he does not, however, tell us; neither has he condescended to explain what it was that brought the carriage to a halt when going at so triumphant a rate. He says, the velocity *might* have been continued "under similar circumstances;" but if it might, why has the experiment not been repeated at one time or other? The "similar circumstances"—"a wet road with patches of gravel upon it"—could not have been difficult to meet with; and he must have been well aware that a hundred miles actually performed on such a road, at such a velocity, would be of more avail with the world than millions of bare averments of what "might" or "could" be done. To our minds, there needs no better proof that Mr. Ogle never did realise such a rate of going, than the fact that he has never yet seen fit to repeat the achievement, either "under similar circumstances" or under any other circumstances whatever.

The best commentary on Mr. Ogle's ideas of what his engine is capable of performing for a continuance is to be found in his own admissions as to what it has actually done, on an out and out journey from one place to another. Having stated that it had gone from London to Southampton with nineteen persons on it, and seven hundred weight of water, he was asked, "At what rate did you travel with that load?" He answered, "*We travelled about ten miles an hour.*"

We do not of course mean to say that Mr. Ogle has asserted that which he knew to be untrue, in stating that his carriages have gone at the rate of 24½, 32, and 35 miles an hour; we take it for granted that it is through being deceived himself that he is helping to deceive others. When asked what mode he took to ascertain the velocity at which he travelled, he made for answer, "We know pretty accurately by observation at what rate we are going; but we *can* ascertain with the greatest minuteness, by knowing the number of revolutions made by a wheel of a certain diameter." He does not, it will be observed, say that his practice actually was to count the revolutions of the wheels; he only mentions it as a

mode which *can* be adopted: his practice, on the contrary, seems to have been to depend on "observation" alone; so that his wonderful statements have, after all, nothing better than mere guess-work for their basis.

If we take farther into account the gross ignorance which Mr Ogle displays in his evidence, of the principles of locomotion, all surprise at the extravagance of his statements ought to vanish entirely. Ignorant people are always egregious guessers. The merest tyro in mechanics knows that weight is *every thing* in locomotion, be the impelling power employed what it may; yet Mr. Ogle affirms boldly that "weight is of *no importance to a steamer*." If this were but true, one hundred miles an hour ought to be as certainly attainable as ten or twenty, and one hundred tons be as readily transportable as one hundred pounds; and so, in fact, Mr. Ogle maintains, for he absolutely asserts at last that "the power we have, *beyond all question*, TO PROPEL VEHICLES OF ANY WEIGHT, AT ANY REQUIRED VELOCITY!!!" No wonder Mr. Ogle should afterwards pronounce "railroads behind the age!" The reader will perceive that it amounts simply to a modest averment that the age is behind Mr. Ogle. That an age will ever arrive worthy of possessing so stupendous a genius, we have great doubts. We think he would run small risk were he at once to take for his motto,

"Panting Time toils after him in vain."

Of this we feel well assured, that should an age ever arrive deserving the name of *Ogleonian*, there will then be three things besides steam-flying not far from being discovered—the perpetual motion, the philosopher's stone, and the way to the moon.

We have seen how Mr. Summers has helped, in one instance, to reduce the statements of his partner, Mr. Ogle, within reasonable limits; but it must be confessed that in others he falls very little short of him in carelessness of assertion. As Mr. Summers has pleaded the benefit of an error of the short-hand writer in explanation of that part of his evidence to which we are now about to allude, we shall transcribe it literally from the Minutes, in order that the reader may be the better able to judge of the worth of this plea in abatement:—

"What distance have you ever continued travelling at the rate of thirty miles an hour?—We have continued travelling at the rate of *thirty miles an hour, four hours and a half*, very frequently, and could have continued to have gone *longer*, had we not required a fresh supply of water, our tank being not quite large enough.

"How could you continue to travel at the rate of thirty miles an hour, when you have already given so low a mean average of travelling (ten miles) on account of your fireplace?—Because it depends on the quality of the fire; we have never had any difficulty in travelling over the worst and most hilly roads, since our last improvement in the furnace, when the fire is in good order."

Mr. Summers, it will be observed, *is* here represented as positively asserting, that they travelled "at the rate of thirty miles an hour, four hours and a half, very frequently;" and when admonished to reconsider his words, by the form of the next question put to him, ("How *could* you continue to travel at the rate of thirty miles an hour," &c.?) he offers no correction of the statement, but leaves the Committee so perfectly impressed with the notion that a speed of thirty miles an hour had been actually kept up for four hours and a half at a time, that in their Report to the House they quote Mr. S.'s statement to this effect, as one of their principal reasons for believing that every obstacle to continuous steam travelling on common roads had been removed.

When, however, the Report and the Evidence were made public, and practical men began to question the possibility of such a performance, Mr. Summers sent a letter to this journal (Mar. 24, 1832) in which he stated that his evidence had been wrong taken down, and that what he really did say was, that he had travelled "for the space of four *miles* and a half—not four *hours* and a half—at the rate of thirty miles an hour."

Mr. Summers must, of course, know best what he *meant* to say, but if the word *miles* was really that which he used, the short-hand writer must have done him another act of injustice in afterwards representing him as saying that they "could have continued to have gone *longer*." *Farther* would have been the phrase naturally used had the space travelled over, and not the time occupied, been the thing uppermost in the witness's mind.

But granting Mr. Summers the full benefit of his explanation, let us see how it mends matters. He travelled, he says, "for the space of four miles and a half at the rate of thirty miles an hour;" and that not once or twice, but "*very frequently*." Now, if four miles and a half can be so readily done at the rate of thirty miles an hour, we can imagine no reason why fifty or a hundred should not be done at the same rate; making allowance always for stoppages to take in fuel and water. The statement of Mr. Summers, as it stood originally, is to our minds not a whit more marvellous than it is according to his corrected version. The really astonishing part of the affair is, that he should have ever travelled at such a velocity at all on a common road. It is less, to be sure, than Mr. Ogle claims credit for, but still prodigious—incredible! A mile in two minutes!!! Believe it who may, we do not.

If four and a half miles have been so "very frequently" performed in nine minutes, there must have been clouds of witnesses besides Mr. Summers himself—but where are they? Even his partner, Mr. Ogle, who is evidently no stickler, testifies to nothing of the kind. And if they have so "very frequently" travelled four miles and a half at this velocity, how happens it that they never travelled more? Why always just four miles and a half? Why never five, or ten, or twenty? Mr. Summers has stated as a reason for their not continuing to go on at the same speed, that "they required a fresh supply of water;" but immediately afterwards he starts quite a different reason, namely, that "it depends entirely on the quality of the fire." Which reason are we to consider the true one? And to what would either amount but to an accidental difficulty which might have been easily obviated?

We think we can, without travelling out of Mr. Summers' own evidence, show that the speed he pretends to have "very frequently" realised on a common road could not possibly have been accomplished. When examined as to the difference of travelling on common Macadamised roads and street pavements, he stated that he had found the steam carriage travelled "with much greater ease" on the latter than on the former; so much so that even when "travelling on a *rough bad* pavement, they do not consume more than one-fourth of the steam they do on a gravelly soft road." Why is this? Because evidently of the difference in friction. Now, the road on which the four miles and a half were travelled in nine minutes was, according to an explanation appended by Mr. Summers to his correction of the error in the report of his evidence, (See Mech. Mag., Mar. 24, 1832,) "an indifferent road, gradually ascending, and covered with patches of gravel"—just such a road, in short, as that which he says requires four times more steam power than a "rough bad pavement." If, therefore, he could travel at the rate of thirty miles an hour on such a road, he ought to be able to travel on a "rough bad pavement" at the rate of one hundred and twenty miles an hour; and on an iron railway (supposing the friction on it to be only five times less than on a "rough bad pavement") at the rate of six hundred miles an hour—that is, many times quicker than the most violent tornado that ever swept the face of the earth!!!

We feel convinced that Mr. Summers, like Mr. Ogle, must have deceived himself, through following some very fallacious mode of estimating the distance travelled. The very fact, that they differ so widely about the rate at which they went, (being, as they were, "always" together,) is of itself sufficient to show that there must have been great uncertainty in the means of reckoning which each adopted. There is not a single statement on this head made by the one which is not contradicted by the other; and such being the case, there is but one safe course for the public to follow, and that is (for the present) to trust neither.

Mr. Stone, who had the management of the carriage of Mr. Gurney, which ran for some time between Gloucester and Cheltenham, was asked, "what do you suppose is the greatest weight you could draw by that carriage, at the rate of *ten* miles an hour?" His answer was "from forty to fifty hundred weight," equal to about fifty passengers. He was not asked at what rate he had generally travelled, or what was the greatest speed he had ever accomplished; but we have reason to know that his evidence on these points would not have raised the average higher than it has been done by Mr. Gurney himself.

Mr. Farey, who, though no steam-car-

riage projector himself, has an intimate practical acquaintance with all that has been done and attempted in this way by others, and unites to it a perfect knowledge of the principles on which the chances of ultimate success depend, states that the utmost which has been proved to his satisfaction is, "the practicability of impelling stage coaches by steam, on *good common roads, in tolerably level parts of the country, at a speed of eight or ten miles an hour.*"

As Mr. Farey has said, so say we, and so we think every person must say, who weighs calmly and dispassionately the facts we have here cited. We grant that it has been practically demonstrated, that an average speed of ten miles an hour may be accomplished by steam carriages on common roads; but we deny that there is the smallest evidence to justify an expectation of much more than ten. Eleven, twelve, or thirteen miles an hour may possibly be done; but to lead people to expect that *twenty* will ever be realised, we hold to be gross and mischievous delusion.

But we have said that "the principles of nature and art alike forbid,"* the accomplishment of such a rate of velocity on common roads. Yes, and so they undoubtedly do. Nature has opposed two forces, which must always remain the same (this side of the Ogleonian age at least), gravity and friction; and Art has discovered that to enable a complicated and delicate apparatus, like a steam carriage, to bear the violent shocks and concussions inseparable from very rapid travelling on common roads, it must be increased in magnitude and weight in a degree utterly incompatible with celerity of motion.

"Animo" adverts, in a manner which appeals strongly to our sympathies, to the capital which different confiding individuals have embarked in the prosecution of steam-carriage speculations. But are not those who might be tempted, by such delusive representations as we have been exposing, to risk their fortunes on similar ventures, entitled to at least equal regard? We have heard of such things as one set of speculators getting out of a bad thing by letting others into it. We have really, however, nothing to do with such personal considerations. Truth is our sovereign lord and master; and, come what may, him we will faithfully serve, "with all our might and with all our strength."

* Mr. Gordon, in the last Number of his Journal, represents us to have "declared a steam-carriage on the turnpike road to be forbidden by nature and art." It would be mincing matters to call this a mere misrepresentation of our meaning; it is a wilful falsification of it. Where all, however, is deception and mystification, it would have been something strange if so fitting an auxiliary as verbal misquotation had been overlooked.

REVIVAL OF OLD PATENTS.—C. Q. would not find it a difficult matter to obtain a new patent for the old patent invention of which his relative purchased a share some thirty-five years ago; in fact, unless there is a caveat on the file against him (which is not likely), it would be granted as a matter of course. Such things are of every-day occurrence, and, truth to say, the more the shame. It is proper, however, C. Q. should be made aware that the patent when obtained would be of no validity in law.

PADDLE WHEELS.—The notice in a contemporary journal to which "Aquarius" alludes, respecting the paddle wheels of the steam boat which formed part of the expedition sent out from Liverpool to the Niger, was entirely erroneous. We are assured by a gentleman who had a principal share in fitting out the expedition, that the paddle wheel made use of was one of the common sort, but so attached that it could be unshipped occasionally.

Gigantic Steam Engine.—One of the largest steam engines, and probably the most powerful one in the world, has commenced working at Colonel Braddyll's new colliery at South Hetton, near Durham. It has been erected for the purpose of pumping water from a depth of 876 feet. The diameter of its cylinder is 84 inches, length of stroke in the cylinder nearly 10½ feet, ditto in pumps nearly 8½ feet, diameter of pumps 18½ inches; and when worked at ordinary speed it will throw up from 55,000 to 60,000 gallons of water per hour. Its power is rated at 240 horses but it is capable of exerting the power of 300 horses in action together.—*Times.* There are two or three larger steam engines than this in Cornwall. The Consolidated Mining Company have one, the cylinder of which is 90 inches in diameter, and which pumps water from a depth of nearly 1,200 feet.

INTERIM NOTICES.

We regret that we received the papers respecting the Highgate Tunnel at too late a period of the week to place in the proper point of view the share which the late Mr. Rennie had in that unfortunate undertaking. It appears that though the original design of the Tunnel was by Mr. Rennie, that design was not adhered to in the execution of the work.

"Candidus" next week.

"Caveat" has our thanks. We are not inattentive to the measure which Mr. Godson has in progress.

Communications received from Mr. Shires—Mr. Wheatley—H. B.—Mr. Feddon—Mr. Rutter—E. W. B.—Mr. Dewhurst—R. G. C.—Mr. Cottam.

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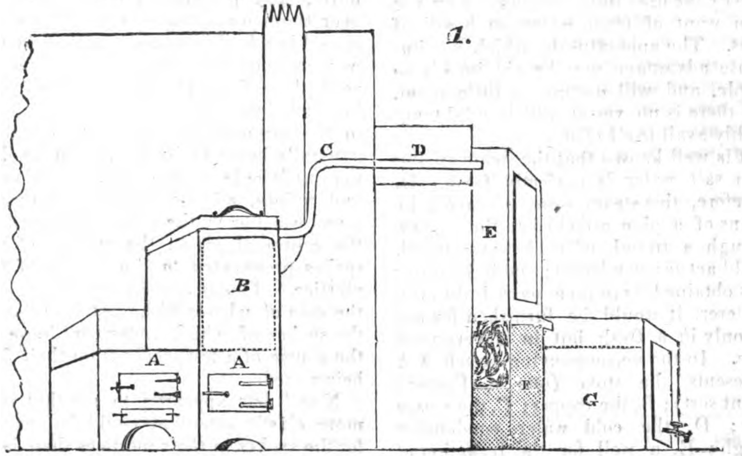
Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 501.] SATURDAY, MARCH 16, 1833. [Price 3*d*.

APPARATUS FOR FRESHENING SALT WATER.



MALLET'S IMPROVED WAGGON WHEELS.

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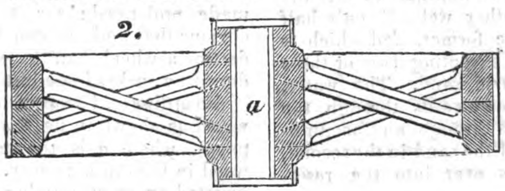

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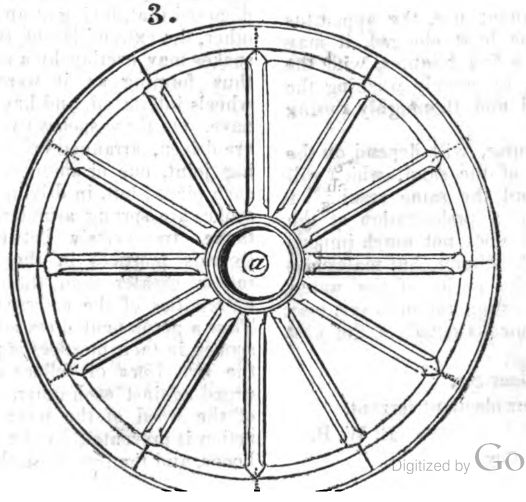


APPARATUS FOR FRESHENING SALT WATER.

Dear Sir,—I beg to submit for insertion in your truly valuable Magazine, the design of an apparatus intended to remedy the dreadful consequences arising from want of fresh water on board of ships. The apparatus by which this immense advantage may be obtained is so simple, and will occupy so little room, that there is no vessel which might not readily avail itself of it.

It is well known that the steam arising from salt water is perfectly fresh. If, therefore, this steam were conveyed, by means of a pipe attached to the copper, through a trough of cold water, which would act as a condenser; and if the water thus obtained were then passed through a filterer, it would be furnished for use not only in a fresh but in a very pure state. In the accompanying sketch A A represents the stove (one of Frazer's patent sort); B, the copper; C, the steam pipe; D, the cold water condensing trough; E, a well for the reception of the water to be purified, which is half filled with sand, and coarse gravel on the top of it, and communicates at the bottom with another well, F, only half the height of the former, and which is also to be filled, excepting two or three inches, with coarse sand. The water, after filtering downwards through the first well, ascends through and accumulates on the top of the sand in the second, whence it passes over into the reservoir, G.

If, from frequent use, the apparatus should get in the least clogged, it may be cleansed in a few minutes, with the utmost facility, by merely washing the sand and gravel and thoroughly rinsing the pipes.

Much, of course, will depend on the size and purity of the sand, which will not always afford the same results. I have found that a prolongation of the stratum of sand does not much impede the produce of the filterer, but materially contributes to the purity of the water, which, it is not exaggeration to say, may be had by this means equal to the best spring water.

I remain, dear Sir,

Your obedient servant,

E. W. B.

Old Broad-street, City.

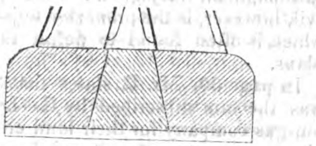
MALLET'S IMPROVED WAGGON WHEELS.

Sir,—I beg to transmit you a mode of constructing waggon and other large wheels for carriages, which I think is novel, and possesses some advantages over those usually adopted. I have observed in wheels made according to the now common method, with spokes nearly vertical to the axis of the wheel and inserted into the same felloe, and also in the ordinary dished wheels, that they generally begin to fail first, by the spokes getting *loose* in the *mortices*, at both nave and felloes, arising either from unseasoned wood or by the vibration caused by the continual jar on the endway of the spokes propagated to the bottom of the mortice. This is forcibly exemplified in the case of wheels with cast iron naves, the spokes of which always get loose in the course of a few weeks from their first being used.

Now it has appeared to me that if a more elastic retention could be devised for the spokes in their mortices than is to be obtained by the common way of wedging, this loosening would be lessened, and the duration of wheels so made prolonged; for it is sufficiently obvious that nothing can tend sooner to destroy a wheel than the percussions produced by spokes loose in their mortices.

Accordingly, I propose to construct my wheel as shown in fig. 2 and 3 (see front page), where *a* is the nave, made of wood in the ordinary way. Into this are inserted an even number of spokes, so disposed that, laying at an angle to each other, the extremities of two contiguous spokes may overlap by a small distance, thus forming as it were *two* dished wheels interlaced, and having a common nave. On these spokes two sets of felloes are driven, arranged brickwise or breaking joint, one or more spokes being in each piece; but, in driving them on, the spokes are sprung asunder, by the distance, transversely between two contiguous mortices in the felloes, being rather greater than that between the extremities of the corresponding spokes. Thus a permanent cross strain of all the spokes in their mortices is produced, and the two lines of felloes are constantly urged against each other. The splitting of the wood of the nave by this cross action is prevented by the ordinary nave hoops, and the tire is sunk on in the or-

dinary way. When a still wider felloe is required, a wedge-shaped piece may be inserted between the exterior felloes, as in fig. 3. I adopt without commentary the cylindrical wheel and axle, the disadvantages of either being conical being sufficiently shown.



It will readily be perceived, that not only are direct vertical strains well resisted by this wheel, but that cross strains are better resisted than in ordinary wheels, in proportion as the spokes make a greater angle with each other, and that its general stability and consequent durability is ensured by its forming, when put together, that compact and elastic whole upon which the strength of every system of opposing forces in machinery depends.

I am, Sir, &c.

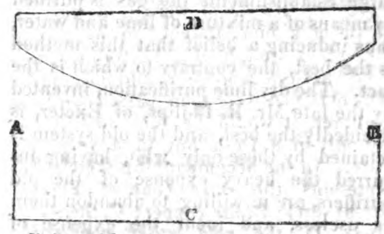
ROBT. MALLET.

94, Capel-street, Dublin.

CARRIAGE-BUILDING.

Sir,—In the answer of "Phæton" to "Junius Redivivus" he states that a landau is not required to be so unalterable as the plates suggested by him would make it. Now, either he must be a practical body-maker or he cannot have seen much of that work done; else he would know that the bottom side cannot be *too* firmly fixed. We use, however, edge-plates that answer the purpose, and at less expense, than those suggested by "Junius." Phæton says the contracting of the leather is a reason for not using edge-plates in landaus. Perhaps he will point out how this objection could apply in the case of barouches and britchkas, which the leather cannot affect. I will now give a proof of the efficacy of the edge-plates.

In the shop I work we fixed on inside edge-plates to a landaulet seven years ago, and the doors now open and shut as well as those of a chariot or coach. We have landaus, barouches, and landaulets, which now open and shut as correctly as a well-made coach or chariot, and we will warrant them to do the same six years hence. With respect to ash rockers, they do not answer effectually, and I am sure they add nothing in point of beauty. We took a pair of them off a landaulet, and fixed on our edge-plates, a few weeks ago. The only way in which the leather affects the doors is by contracting the standing pillars; but if these be properly fixed at first, this will seldom occur. The subjoined rough sketches will give some idea of the edge-plates I have been speaking of:—



D is a side-view of one of these plates; A and B are flaps, which are fixed to the front and hind bars; C is the side of the plate, screwed to the inside of the bottom side.

I am, yours, &c.,

A CARRIAGE-MAKER.

P. S.—In my last letter I ought to have stated, that the edge-plates are all fixed on the inside, some forming the rocker, and others on the rocker.

ON LIGHTING SMALL TOWNS WITH GAS.

Sir,—On reading your description of Mr. Rutter's publication on gas lighting, and seeing how very strongly you have recommended it to the public, I was induced to procure it. I have looked it through carefully, and as I presume that you have no wish but for the public benefit, notwithstanding the very unqualified praise you bestowed on this work, I am induced to send you a few observations upon it.

The first nineteen pages of the work are very little to the purpose, and will require but brief notice. In page 4, Mr. R. states that Murdoch first applied coal-gas to the purpose of lighting in Cornwall, but he omits altogether the name of Windsor, who first exhibited it to public notice in London, and, I believe, was involved in ruin by so doing. In the year 1800, I engaged with a friend in a series

of experiments for the production of gas from wood, turpentine, resin, fat, and oils, and finally coal, and constructed an apparatus for the purpose of lighting a manufactory with coal gas, which apparatus consisted merely of a brick oven, condenser, tar well, and conducting pipes, the total expense of which was not 20*l.*, which answered its purpose well, and continued in action, without needing the least repair, nineteen years, when it was taken down, its site being wanted.

In page 14, Mr. R. states, that in very large establishments the gas is purified by means of a mixture of lime and water, thus inducing a belief that this method is the best, the contrary to which is the fact. The dry lime purification, invented by the late Mr. R. Philips, of Exeter, is decidedly the best, and the old system is retained by those only who, having incurred the heavy expense of the old purifiers, are unwilling to abandon them as useless, and incur the expense of erecting new purifiers on the dry lime system. Mr. R. is also deceived in thinking it better to pass the gas through water, as it is found by experiment that, under any considerable pressure, water alters the chemical composition of the gas, but diminishes its illuminating power very considerably, and in addition to this it occasions loss by absorption.

In page 17, Mr. R. says, "It is only within the last few years that gas-light has made any considerable progress amongst the smaller towns." Now, Sir, it is about twelve years since that a sort of universal or general gas company was planned, amongst the projectors of which Lieutenant (now Captain) Kater figured amongst the most active. The committee of this projected company called on the gas engineers (so called) and experimental men for information, as to whether they could devise any method by which small towns, of from 3 to 5,000 inhabitants, could be lighted with advantage to the manufacturers. At the request of the committee of this company I attended them, and stated to them my opinion that it could be done, and proposed certain experiments to be tried for ascertaining the point; but I found the committee, of whom Lieut. Kater was unfortunately for them the chairman, so satisfied of the impossibility of the thing being done, that they declined the proposition, Mr. Kater stating that they had obtained the opinion of all the gas engineers in the kingdom on the matter, and that they were unanimous on its impossibility. I, however, carried my experiment into practice, and succeeded far beyond my expectations.

Mr. R.'s observations, p. 27, relative to patronage are very good: a still greater evil, however, is the proneness to jobbing, which is often found to defeat the best plans.

In page 30, Mr. R. states that 3,000*l.* was the sum subscribed by the Lymington gas company for their land erections, pipes, apparatus, &c.; and I presume that the detailed estimate in p. 32 was that for Lymington, or at least was based on it. It also appears that Lymington commenced with fifty-two public and ninety private lights. I therefore presume that the quantity of light mentioned in p. 35—namely, fifty-five public, and one hundred and sixty private lights, are the numbers for the supplying which the apparatus of Lymington has been constructed. Mr. R. does not say as much, but there is pretty strong internal evidence in the details to warrant the supposition.

We will commence the analysis of these details:—

In page 33, Mr. R. takes the average produce of a chaldron of the best coal at 10,000 cubic feet = 7,400 per ton. I will take it, however, at 8,000 feet per ton, as coal that will not produce that quantity ought not to be used. I prefer also taking the larger quantity, as it is in favour of Mr. Rutter, and I prefer also calculating by weight, as the frauds in selling coal by measure will set all calculation at defiance. I shall also take its price a little higher than Mr. R., as it will in general be found higher than that named by Mr. R.

In the article of wear and tear, Mr. R. may be assured that he has allowed himself to be very much deceived to produce the quantity of gas he mentions—namely, 4,228 feet per night for the public lights, and 3,200 feet for the private lights, and one tenth more for waste; this would require one ton of the best coal to be carbonised in the retorts within the 24 hours, which could not be done by fewer than 5 retorts working at 8 hour charges. At this rate of working (which is the best), the retorts, if sufficiently stout and scientifically set, and the coal used

for firing them is but moderately sulphureous, will last about twelve months, and to replace them will cost at least 60*l.* If, however, the retorts are thin or badly set, or the coal used should be highly charged with sulphur, or if fewer retorts are used and worked at six hour charges, the wear and tear will be very much increased, as it often happens in such cases that the retorts burn out in six months or less, as has happened to the lately constructed gas works at Bridport, where they have had to reset their retorts in about four months. Another great mistake, into which Mr. R. has fallen, is that of supposing that the fuel used in heating the retorts will not exceed 25 per cent: he may be assured that he will find at the end of the year that it will prove full 30 per cent.

Mr. R. states the public lights at 3*l.* per light, and supposes that the company will obtain a profit of 15*l.* per annum at this price, estimating the gas to cost the company but 4s. per 1,000 cubic feet.

To show the inaccuracy of Mr. R.'s data as to the price at which gas may be supplied to the public, or street lamps, —adopting the data of that gentleman generally, but correcting them—we must charge this gas with the price of the coal used for producing it (deducting the value of the coke produced), and the wages of the lamplighter, its proportional share of the wages of the two stokers, of the salary for superintendence, of the lime used for purification, of the wear and tear of apparatus, and of the interest of the capital expended in the construction of the works. Thus

	£	*s.*	*d.*
750·834 ÷ 8000 = 93·75 tons add 1-10th for waste from leakage, and 30 per cent for fuel = 134 tons at 1*l.* 1s.	140	14	0
Lamplighter, 31 weeks at 12*s.*	18	12	0
The proportional share of two stokers, at 15*s.* each, being as 1351·794 is to 78 so is 750·834 to	43	6	8
The like proportional share of the lime used for purifying	13	6	9
The like proportional share of the wear and tear, calculated at 60*l.* only per annum	34	2	8
The like proportional share of the superintendance	27	15	0
Interest on the like proportional share of the capital	85	8	0
	363	15	1
Deduct 67 tons of coke from the retorts, at 26*s.*	87	2	0
	£276	13	1

Now 276*l.* 13s. ÷ 750·834 = 7s. 4d. per 1,000 feet, and as each light consumes $5·5 \times 14 \times 177 = 13·629$; this at 7s. 4d. is 5*l.* for each light, which it will cost the company, allowing themselves five per cent on their capital. If we state the total account, throwing the gas consumed by the public and private lights together, we shall find that it costs the manufacturer 6s. 11¼d. per 1,000 feet, charging 5 per cent on the capital expended. This shows incontestibly that the public lights cannot, on this plan, be supplied at a less sum than 5*l.* each per annum, without a sacrifice on the part of the manufacturers; and the Lymington company will find that at 3*l.* per annum they are actually paying 100*l.* per annum towards the public lights, in addition to what they may be liable to pay under the public rate and in their individual characters. The expenditure here taken is at a much lower rate than warranted by experience on this plan. If, at the expiration of three years, Mr. Rutter will furnish the public with a copy of the actual payments and receipts of the Lymington gas company, and a description of the entire apparatus, he will be conferring a benefit.

The three grand points to be attended to, in lighting small towns of from 500 to 6,000 inhabitants, are to diminish the expense of fuel used in heating the retorts, to diminish the labour and attention in working the apparatus, and to diminish the wear and tear as much as possible. About thirty-two years since, I commenced a series of experiments, extending over a period of twenty years, and finally adopted the plan of producing gas by the heat generated in burning coal into coke. This had been done by Mr. Cubit, at Reading, but in a very

defective manner, the retorts there burning out with great rapidity. The retorts at the Coventry gas works were also heated with ovens; but though these worked off their charges sufficiently quick, yet it was at the expense of the coke, which was much injured, if not wholly destroyed. After many trials, I succeeded in so arranging matters, that the heat is entirely under the control of the operator: he is always certain of producing a first-rate coke in the oven for founderies, and drying malt, and he is enabled to work off his retorts, either in six, eight, or twelve hour charges, at pleasure; and it requires the least possible quantity of labour and attention—1*l.* 1s. per week being ample for that purpose, for a town of 5,000 inhabitants, and the small towns not requiring more than one or two retorts. The wages actually paid are 5s. per week,* yet the apparatus may supply a rental of from 200*l.* to 400*l.* and upwards per annum. The expense of coal on this plan is absolutely reduced to nothing, as the coke produced has always found a ready sale at the original price of the coal, and the retorts are found to last four years, owing to the protection they receive from the manner of setting them. The gas engineers are in the habit of crying down all plans of heating by this method, owing to their ignorance of its details, and consequent incapacity to undertake its construction; the only objection which I have heard urged against it, namely, the want of sale for the coke, and the not producing sufficient heat, has been abundantly proved to be without the slightest foundation: the quantity of hard coke produced by an apparatus requiring five retorts, is a mere bagatelle for the neighbourhood; and as to heat, I have had a retort melt by the intense heat produced in one of my early experiments, which taught me at once the ignorance and arrogance of those who had so confidently asserted that there could not be sufficient heat generated on this plan, and also the necessity of guarding against similar accidents. The superiority of this plan over every other, is completely established by the fact that the saving in labour, in wear and tear, and in the fuel consumed in heating the retorts on the old plan, amounts to considerably more than the total cost of the coal necessary for the ovens; consequently the whole of the coke is a gain on this plan.

These matters are of great importance to the public, as the demand for gas is rapidly extending. I have lately seen a very admirable and economic plan for heating hot-houses with gas, of which I propose sending you a sketch as soon as I can spare the time: it appears to combine every requisite, as the heat generated can be increased and diminished with the greatest ease, with thermometric nicety.

I am, Sir, yours, &c.

C.

Feb. 21, 1833.

* This is not mere assertion. There is a small town now lighted on my plan: it has but one retort, yet is paying already to the subscribers 20 per cent.

EXPANSION AND CONTRACTION OF BUILDING STONES.

The *American Journal of Science* contains an account of a very interesting set of experiments, made under the direction of Colonel Totten, of the U. S. Engineers, at Fort Adams, Newport Harbour, for the purpose of ascertaining whether certain fissures in the coping of a public building at that place could have arisen (as was suggested) from a change in the dimensions of the coping-stones, produced by the ordinary variations of atmospheric temperature. These experiments clearly establish that stone is expanded by heat in the same manner as wood or metal; granite in the proportion of ·000004825 per inch for each degree of Fahr.; marble, ·000005668; and sandstone, ·000009532. To illustrate the practical influence of this variation, the relater of the experiments supposes the case of two coping-stones, each five feet long, having been laid in Midsummer, when the temperature was 96° Fahr. "In winter," he proceeds, "their temperature may be safely assumed at zero, so that the total variation of temperature will be 96° * * If the coping be of granite, the distance by which the ends of the stones would be separated in consequence of *one* degree's variation, would be 60 inches multiplied into ·000004825 = ·0002895, and for a variation of 96 degrees this distance becomes ·0002895 × 96 = ·027792 inch, giving a crack a little wider than the thickness of common pasteboard. For marble this crack would have a width of

·03264, nearly twice the thickness of common pasteboard; and for sandstone ·054914, nearly three times the thickness of pasteboard. Such cracks are not only distinctly visible, but allow water to pass freely. The mischief, however, does not stop here; for by this constant motion back and forth in the coping, the cement, of whatever kind the joints may be made, will be crushed to powder, and in a short time be totally washed away by the rain from its place, leaving the whole joint open."

SOLUTION OF THE THIRD MATHEMATICAL QUESTION, p. 157.

Question.—A 13-inch mortar, with a charge of $7\frac{1}{2}$ lbs. of powder, is found to throw a shell of 196 lbs. 4000 feet on an ascending plane, the elevation of the mortar being $36^\circ\ 32'$. Required the elevation of the plane.

Solution.—By article 191, vol. ii of the Woolwich Course, we have $\left(\frac{2 \times 7\frac{1}{2}}{196}\right)^{\frac{1}{2}} \cdot 1600 = v = (2ag)^{\frac{1}{2}}$ ∴ the impetus or value of $a = \frac{15 \times \overline{800})^2}{49 \times 64\frac{1}{3}} = 3045{\cdot}3$.

Let A = angle of direction above the horizon, B = ∠ of inclination of the plane, C = ∠ of direction above the plane; then by theorem 1st, p. 207, vol. ii. of the Course, $\frac{\text{sin. C.}}{\text{cos.}^2 \text{B.}} = \frac{\text{R}}{4a \cdot \text{cos. A}} = \frac{4000}{9787{\cdot}716} = {\cdot}408675 = b$ ∴ sin. C = cos.² B·b; but sin. C = sin. (A − B) = sin. A · cos. B − cos. A · sin. B = cos.² B · b or sin. A · cos. B − cos. A · cos. B · tan. B = cos.² B · b, or sin. A · cos. B − cos. A · cos. B · tan. B = cos.² B · b, or sin. A − cos. A · tan B = cos. B · b, or sin, A − cos. A · tan. B = $\frac{b}{\text{sect. B}}$. Assume, sect. B = x, sin. A = s, cos. A = c ∴ $s - c\,(x^2-1)^{\frac{1}{2}} = \frac{b}{x}$, or $sx - cx\,(x^2-1)^{\frac{1}{2}} = b$, or ${\cdot}59525x - {\cdot}80351x\,(x^2-1)^{\frac{1}{2}} = {\cdot}408675$. And solving this equation, the value of x, or the natural secant of B, will be found to be = 1·030057 ∴ the ∠ B or the required inclination of the plane = $13^\circ\ 52\frac{1}{2}'$.

Remark.—The above being of the 4th order, the solution is attended with considerable labour. Had we consulted our own ease, a like result might have been obtained from the rule of double position, from the equation $\frac{\text{sin. C}}{\text{cos.}^2\text{B}} = {\cdot}408675$. For C + B = $36^\circ\ 32$, and the log. of ·408675 = − 1·611378. By a few trials, C is found to be between 22° and 23°.

1st. Suppose C 22° log. sine = ...	1·573575
∴ B = $14^\circ\ 32$, and cos.² B = − 1·985876 × 2 =	1·971752
Log. . . .	1·601823
Given log.	1·611378
1st error	009555
2d. Suppose C 23° log. sine	1·591878
∴ B $13^\circ\ 32'$ and cos.² B = − 1·987771 × 2 = . . .	1·975542
Log. . . .	1·616336
Given log.	1·611378
2d error	·004958
	·009555
Sum of the errors	014513

Hence 014513 : 60′ :: 009555 : $39'\frac{1}{2}$

Consequently, the angle of inclination of the plane is = $36^\circ\ 32 - 22^\circ\ 39\frac{1}{2} = 13^\circ\ 52\frac{1}{2}$ the same as before found.

IVER MACIVER.

HIGHGATE TUNNEL.

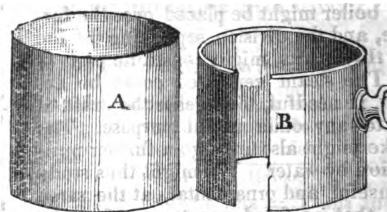
Sir,—In consequence of your statement, in the Mechanics' Magazine for February 23, "that it was the late Mr. Rennie who designed the (Highgate) Tunnel which fell in," I herewith send you copies of Mr. Rennie's Reports respecting that work, by which you will perceive that the tunnel which fell in was not executed after Mr. Rennie's design, but, on the contrary, that it was owing to the perversity and ignorance of the parties entrusted with the execution that the work fell in. Had you, in the first instance, applied to me, I should have gladly afforded you every information; in the present instance, it is painful for me, to be called forth to reply to loose assertions, which are nowise founded in fact, and cannot promote the object of your otherwise well-conducted publication. Trusting to your candour to insert this contradiction,

I remain, Sir,
Your obedient servant,
GEORGE RENNIE.

Whitehall, March 7, 1833.

We willingly give insertion to this letter, and having attentively perused the Reports which accompanied it, we feel bound to add, that they prove most satisfactorily that the late Mr. Rennie was not only well aware of those defects in execution which led to the failure of the Highgate Tunnel, but showed clearly how they might, in the first instance, have been avoided, and how, when committed, they might have been remedied. We infer also, from the language of the Reports, that the tunnel was originally "proposed by Mr. Vazie," and that Mr. Rennie was only consulting engineer. But we must, in justice to ourselves, observe, that it does not seem to follow necessarily from this, that it was *not* the late Mr. Rennie who designed the work; neither does Mr. George Rennie say positively that it was *not*. Mr. Vazie may have "proposed" the thing, and Mr. Vazie, or somebody else, may have executed it, and yet Mr. Rennie have been the person who supplied the working plans or designs, the deviations from which were the cause of failure. If this be (as we suspect) the real state of the case, it is hardly fair to accuse us of having made a "loose assertion, nowise founded in fact," when we stated that "it was the late Mr. Rennie who designed the tunnel that fell in." We may not in this have told the whole truth, but we told at least all that we knew. The fact, that Mr. Rennie's designs or instructions were not attended to, was as unknown to us as we believe it to have been not only to the public at large, but to the generality of his professional brethren.—ED. M. M.

APPLICATION OF THE SPLIT-RING TO ASTRONOMICAL PURPOSES.



Let A be a cylinder, and B a split-ring, the spring of which will make it fit close to the cylinder A; then by pulling at the handle D, the ring will be made to turn with a beautiful motion about the cylinder A, and without any shake, though the work may be done bad. If the work be well turned in brass, the motion I find to be most superior, and capable of being applied to indices, &c., with great advantage. Moreover, external forces may be so applied that the pressure of the ring on the cylinder shall always be the same, however it may be worn away by a constant friction. In my thirty-five years' acquaintance with astronomy, I have found no motion in those instruments to give me so much satisfaction where it can be properly applied.

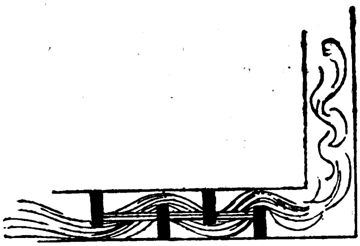
WILLIAM SHIRES,
Mathematical Tutor.

London, Feb. 26, 1833.

FREEING TOWNS FROM SMOKE.

Sir,—Your correspondent, Mr. Evan Leigh, (p. 265) has introduced a plan, which I have recommended for some time, for clearing our towns of the soot and smoke, so annoying where coals are used. Allow me to add to what he there advises, the introduction (at or near the base of the column) of a furnace, heated by coke or charcoal, through which the smoke should be made to pass first up-

wards, then downwards, then up again, thus:—



A boiler might be placed over the furnace, and the division, separating the fire into three parts, might constitute parts of it. The steam generated could be applied, if needful, to increase the draft, if not to any other useful purpose. The smoke might also undergo a further purification by water. We might thus study the useful and ornamental, at the same time that we freed our towns of smoke and those unsightly things called chimneys.

I am, Sir, yours, &c.,
J. C.

Liverpool, Feb. 16, 1833.

THE RIGHTS OF INVENTORS AND INTERESTS OF THE PUBLIC.

Sir,—I am aware that it is contrary to every canon of legitimate criticism for an author to make remarks upon his reviewer, and that it is still more contrary to rule to expect that such remarks should be inserted in the same suite of pages with the criticism; but I have observed that the tone of the periodical you conduct is entirely in favour of the onward march of human improvement, all antique prejudices notwithstanding: and, therefore, as your object, like mine, must be the eliciting of truth, I doubt not that you will set at nought all established rules, and admit my self-vindicatory statements.

The criticism in your periodical is calculated to give an impression that I wished to deprive mechanical inventors of the pecuniary recompense unquestionably due to them by their fellows, for their exertions in the cause of human improvement. Such, assuredly, is not my wish, but the contrary. Even as your own words express it, I firmly believe "that the less a man is taxed for bringing the produce of his inventive powers into the market, the better it will be both for the individual and his country, and the more consonant to every principle of justice and equity."

As an Irishman once expressed himself—"By the powers, I know what I mane myself, but the divil a bit can I make others know what I mane." I am no regularly inducted *littérateur*—have never served my time to the trade of printed words, and can more readily make a thing than describe it. Moved by an impatient desire to make known such things as I have stumbled upon, I have blundered into the confines of authorship, desirous only, so far as possible, to be useful to my fellows, and cheerfully content to take in good part all the buffets I may meet with, while wandering over the hunting grounds wherein the literary clique have been accustomed, from time immemorial, to take their exclusive prey. I shall be as pleased to be knocked down myself as to see others knocked down, whenever the knocking down will serve the cause of truth. In the case of patents, I think I am still misunderstood, and can only wish I had been better taught while young the uses of language, to enable me to place my meaning beyond dispute. May I, therefore, request you to insert the following paragraph, from p. 115 of the *Producing Man's Companion*, premising, that in no way do I profess to be a "Guide," or wiser than my neighbours, but merely a stater of my own opinions, such as they are, and in such style as it has pleased Providence to bestow upon me:—

"There are two classes of persons, who probably contribute more to the general welfare of the community than any others. I allude to literary authors, and mechanical, and other inventors. It is clearly most desirable that the comfortable maintenance of these persons should be provided for in a mode which might afford the best possible security against their falling into want, and which, at the same time, might leave them the fullest leisure for prosecuting their valuable labours, without being under the necessity of occupying their time with painful exertions in the pursuit of money to yield them a subsistence; or of petty details, which more ordinary men would perhaps plod through to greater advantage. The power of invention is, unfortunately for the possessors, though, perhaps, under present arrangements, advantageously for the public at large, rarely accompanied by prudence, but when it is, the

condition of the inventor is improved at the cost of the public. He who invents one thing by a process of induction, as is the case with the higher class of inventors, could, and probably would, invent more: but if he be a prudent man, so soon as he has secured one valuable scheme, he sets to work to perfect it, and then becomes a manufacturer, realising in that mode an infinitely larger pecuniary recompense than he could possibly attain were he to content himself with following the bent of his genius. It is understood that the valuable results of the powers of the late Dr. Wollaston were much cramped in this way. It was also the case with Mr. Heathcôte, the inventor of the bobbin-net machine, which has been of such immense service to trade. Had a trustworthy and responsible government existed, means would long since have been devised to reward inventive talent, in such a mode as would ensure the development of the largest possible amount. But until such a government shall exist, the present imperfect mode must continue, which, after all, is in its actual operation more of a boon to speculative capitalists than a recompense to the efforts of genius."

I was, I suppose, wrong in stating that "patents for *principles*" were valid. I have no means at present of consulting the statute, and take your word for it. But you, also, have mis-stated me: you say *principles* only. My words are, p. 119, "A new principle of nature, or a new application of an old principle." What I *meant*, and which should have been more simply and plainly stated, was—*any new useful invention*, such as patents are usually granted for.

But, though I freely acknowledge, that whoever, by his power of invention, may cause a saving of human labour, or an increase of human pleasure, is fairly entitled to recompense—and liberal recompense—in proportion to the value of his inventions, I cannot agree that that recompense should in any way arise from an injury inflicted upon others, by depriving the public at large of the use of the invention, or of the privilege of inventing it for themselves, as is the case sometimes. The recompense of invention by patent, as the law at present exists, is unjust thus far. It confers a monopoly which a man may use or abuse at his own pleasure. It gives to a man who invents a machine in 1833, the exclusive right to it, and thus shuts out all the rest of the community from the privilege of inventing it for themselves until the expiration of his term. This seems to me very like forestalling. Every day gives us example of the same article being invented by several individuals. Is it right that because A invents it to-day, B should be shut out because he does not invent it till to-morrow? No inventor has any compulsory claim on the public; the matter between them is merely a question of mutual advantage; neither is the inventor obliged to make known his invention; and I much doubt whether any really valuable discoveries would remain hidden, even if no pecuniary advantage arose from making them known. All men love either to astonish their fellows, or to acquire a title to their gratitude; and these motives would, I conceive, be sufficient to prevent the public from suffering to any great extent, unless we are to suppose that inventors are largely endowed with the dog-in-the-manger principle, which would prompt them to destroy a useful invention rather than that others should reap a benefit in which they could not share. I cannot think thus of them. The talent of high invention is seldom unaccompanied by high moral qualities, as in the case of Mr. Watt; and such men are not remarked as being stirred to action by the exclusive love of pecuniary gain. But not for this would I have the public unmindful of their deserts and their wants. I merely wish to reward them in a mode which should interfere as little as possible with the extension of their discovery, and also that that reward should emanate from the whole body of the people, and, above all, that it should not press injuriously upon any portion.

When Mr. Fulton first brought his steam-boat to bear, the state of New York—of which state he was, I believe, a citizen—the state of New York, as a recompense for the great advantages opened to them with the prospect of steam navigation, granted him the exclusive privilege of navigating the Hudson river for a certain number of years. The business was so profitable that rivals soon started up, and the question was tried in the law courts as to the power of the state of New York to grant the exclusive privilege of any river. It was decided against Mr. Fulton, on the principle that all the rivers of the Union were the highways of the Union, and consequently the joint property of all the citizens of the Union, and no one state

could arrogate to itself an exclusive right. Mr. Fulton died, I believe, in poverty; and it is a disgrace to the state of New York that, from that time to this—unless very lately—they have never compensated his family for his claims. The state is in the situation of a merchant, who has bought a *bona fide* commodity, which he has paid for by a cheque on a ruined bank, and then refuses to make it good to the person from whom he bought the commodity. So long as the family of Mr. Fulton are allowed to remain in poverty, a stain will remain on the character of the leading state of the Union, even on the score of honesty; and on the score of generosity, the Congress must be held as the stalking-horse for the sins of omission of the whole Union. If it were right to bestow a pecuniary reward on La Fayette, it is disgraceful to withhold it from the suffering family of Fulton. Such a procedure puts into the mouths of those who are disposed to malign the Union, an incontrovertible charge, that more attention has been shown to national fame, than to national justice. Your periodical is read in the Union, and it would be no slight gratification to me were this appeal to produce the wished-for effect.

My first communication to you was on the subject of a *really* waterproof hat, of which I was assuredly the inventor, not being aware that the self-same article, and the best of the kind, had been invented and manufactured by Mr. Andrews, of Holborn, some time previous. Had Mr. Andrews been a patentee, he might have prohibited me or any other person from making the hats; and therein the public at large would have sustained a damage, inasmuch that he would seem to be the very antithesis of Mr. Franks, as to letting his light shine before men. Now, if the whole nation were to take to liking waterproof hats, it is scarcely possible that Mr. Andrews could supply them; and if he were a cogity, old-fashioned, precise kind of man, liking to do business in his own way and no other, of which kind of character abundant examples might be found, it is evident that he would supply a very small number of persons, and the others would have to go without. In such a case I should think the patent right a great hardship on the mass of the public, and in all cases inconvenient; for even Mr. Franks, or Mr. Warren, or Mr. Hunt, with all their exertions, could scarcely be so efficient as an hundred Franks, or Warrens, or Hunts, scattered up and down the great cities would be, in making known an invention useful to the community. It may be said that patentees can cede their rights to others. This is all well in some cases; but it then makes that a matter of private bargain, which should never be left to individual caprice. It seems to me that an annual pension for inventions, graduated by the value and general utility, as shown by the number who may adopt it after a stated interval, would accomplish all that he inventor could in fairness require, to the extinction of the numerous evils under which both the inventor and the public at present labour, by making invention the pretext for raising a heavy tax from those who, at the time they pay it, can mostly but ill afford it, and, in many cases, are precluded by their poverty from securing that benefit to themselves, which is reaped by the capitalist who makes his prey of their necessities.

And now, whether my views of the subject be right or wrong, I shall leave to those interested to decide, who, I believe, are the whole public; but whichever way their decision may lean, I trust that I shall be entirely acquitted of any design to lessen the pecuniary emoluments of our already ill-requited and well-deserving inventors.

I remain, Sir, yours, &c.

JUNIUS REDIVIVUS.

March 9, 1833.

MR. BABBAGE'S CALCULATING-MACHINE.

In a *third* edition of Mr. Babbage's "Economy of Machinery and Manufactures," which has been this week issued to the public, there is the following very satisfactory note (p. 198) respecting the progress made with the calculating-engine:—

"Since the publication of the second edition of this work, one portion of the engine, which I have been constructing for some years past, has been put together. It calculates in three columns a table with its first and second differences. Each column can be expressed as far as five figures, so that the fifteen figures constitute about 1-9th part of the larger engine. The ease and precision with which it works leave no room to doubt its success in the more extended form. Besides

tables of squares, cubes, and portions of logarithmic tables, it possesses the power of calculating certain series whose differences are not constant; and it has already tabulated parts of series formed from the following equations:—

$$\Delta^3 u_x = \text{units figure of } \Delta u_x$$

$$\Delta^3 u_x = \text{nearest whole No. to } \left(\frac{1}{10,000} \Delta u_x\right)$$

The subjoined is one among the series which it has calculated:—

0	3.486	42,972
0	4,991	50,532
1	6,907	58,813
14	9,295	67,826
70	12,236	77,602
230	15,741	88,202
495	19,861	99,627
916	24,597	111,928
1,504	30,010	125,116
2,340	36,131	139,272

The general term of this is,

$$u_x = \frac{x \cdot x-1 \cdot x-2}{1 \cdot 2 \cdot 3} + \text{the whole number in } \frac{x}{10} +$$

$$+ 10 x^3 \left(\text{units figure of } \frac{x \cdot x+1}{2}\right)$$

HYDROGEN GAS — CAOUTCHOUC BALLS — OXYGEN GAS IN CASES OF ASTHMA.

Sir,—Almost all the popular writers on chemistry, in detailing the various properties of hydrogen gas, describe an experiment which I acknowledge is very simple, and also strikingly illustrative, but it is, notwithstanding, exceedingly dangerous. I allude to the experiment in which it is recommended to generate the gas in a common wine-bottle, or other similar vessel; and to ignite it as it issues therefrom through a metallic tube, or the stem of a tobacco-pipe. I am not very nervous, but I see no necessity for conducting any experiment in a way that implies danger, when it may be easily avoided. An accident that happened to me a few months ago has determined me never to ignite hydrogen gas again whilst issuing from the apparatus in which it is generated. The young or inexperienced experimentalist may inflict on himself or his friends a serious injury if he misunderstand or disregard the precautions that are requisite to ensure security.

The superior density of atmospheric air, as compared with hydrogen gas, renders it necessary to keep up a considerable pressure within the vessel in which the gas is formed. If this be neglected, the external air, pressing on the orifice of the tube, will speedily change places with the gas, much in the same way as water will force itself, through a very small aperture, into a bottle filled with air. When this occurs, an explosive mixture is formed, which, if ignited, will probably burst the vessel with considerable violence.

I would always recommend the transference of hydrogen gas, either to portable gas-holders or to bladders. If it be intended for immediate use, I think bladders are the most convenient vehicles that can be employed.

Since I wrote to you about caoutchouc (India-rubber) balls, p. 309, I have been trying my hand at making them. I have succeeded far beyond my expectations. I do not believe, however, that caoutchouc can ever be advantageously employed as a substitute for bladders for containing gaseous bodies. It possesses the property of contractibility in so eminent a degree, that when the included air, or gas, is permitted to escape, the ball speedily diminishes in capacity. Hence it can be refilled only under considerable pressure, which, it is well known to every pneumatist, would be not only inconvenient, but on many occasions impracticable. Caoutchouc, when very much distended, is not so strong as a good sound cow's bladder, and this I consider no trifling objection to its use. If there be any means of arresting its

contractibility, I should like to be put in possession of the secret.

At present I know of no other use for caoutchouc, when blown into spheres, than that of foot-balls; for that purpose it is admirably adapted. The balls are easily made. If any of your readers wish to become acquainted with the process I employ, I will cheerfully communicate it to them.

I thank Mr. Sharp for his hint for making oxygen gas, but I can assure him it is not new to me. I have adopted it scores of times; and I know of no other plan that is likely, under ordinary circumstances, to supersede it. My suggestions at p. 270 were, of course, intended only for those who can obtain access to gas-works, and to whom it may be important to make a large quantity of oxygen gas, either for public lectures or private experiments, in a comparatively short time. I am so well pleased with my new method, that so long as I can get at a coal-gas retort, I shall never trouble the kitchen-fire. About a fortnight ago I made from one charge of manganese 3500 cubic inches of gas in an hour and a half.

The last few lines of Mr. Sharp's communication I consider very important. I trust he will give to your readers every particular as to the means employed in administering oxygen gas to Mrs. S. during the paroxysms of asthma. One well-attested fact is worth fifty vague speculations and ingenious theories. In this case it appears to me desirable that we should obtain all the information we can, because the subject involves in it the prospect of relief from pain, if not permanent health and comfort, to vast numbers of the human family.

The inhalation of factitious gases as a remedy for certain diseases, was, a few years ago, in high repute in the medical world. As we rarely hear of it now, I suppose it is gone out of fashion. We ought not on that account to shut our eyes against fact and experience. Mr. Sharp says, "my wife was dreadfully afflicted with asthma, and could find nothing to relieve her till I made oxygen gas for her to breathe, which at all times afforded immediate relief." Are there not hundreds at this moment labouring under this distressing disease who would give, to use a common phrase, all the world could they obtain the same relief that Mrs. S. so happily experienced?

J. O. N. RUTTER.

Lymington, March 4, 1833.

THE HYDRO-OXYGEN MICROSCOPE.

Sir,—I must confess myself somewhat surprised at the observations of your correspondent, "Iron," on the hydro-oxygen microscope, though my surprise was somewhat abated when I considered his avowal, "that he had not seen it." Surely, the least he could have done, before he accused "men of acknowledged science and respectability" of "quackery" and "exaggerated statements," would have been to have satisfied himself of the exaggeration by ocular demonstration.* I went to the exhibition with a mind as sceptical as your correspondent's, and left it with my doubts removed and my admiration excited. Your correspondent confines himself to the endeavour to prove the fallacy of supposing that any thing is magnified by the microscope 10,000 times. I shall confine myself to the 500,000, about which he says nothing, as it really appears, in his estimation, to be "too absurd to demand a thought." Your correspondent appears to have forgotten the difference between the multiplication of a line a given number of times and the increase of a superficies a like number; he has taken all the objects he has alluded to as lines, having length without breadth; apparently forgetting that similarity of figure must be preserved in the consideration, and that the square that will contain 500,000 other squares is 500,000 the size of each of them, though its side is not that number of times the length of their sides. In the last part of this interesting exhibition the light, which is made to pass through a circle of 1-5th of an inch in diameter, formed by a drop of water containing the animalculæ, is, at the distance of some feet, spread over the disc of 13 feet (your correspondent calls it 14 feet) in diameter, and, of course, increases the representation of the animalculæ in like proportion. Now, as "circles are to one another as the squares of their diameters," your correspondent will perceive that

* The writer overlooks the possibility of this being out of "Iron's" power. He resides a long way from town.—ED. M. M.

there is the space contained in 608·400 circles of 1-5th of an inch in diameter in a circle of 13 feet diameter, because there are a like number of squares in a square of that diameter, which he will readily perceive by trial, thus—

Ft. Ft. In. Fifths.
$13 \times 13 \times 144 \times 25 = 608{\cdot}400$

I remain, Sir, yours, &c.
G. W.

BLACK CLOTH DYES.

Sir,—Your correspondent, "Chemicus," who writes on the subject of black cloth dyes, (p. 283) no doubt thinks he has communicated to the public a valuable secret when he tells them of a test "to distinguish permanent genuine colours" of black cloth, "dyed in the *wool*, from false or spurious ones dyed in the *piece*." Giving him credit, however, for good intentions, and awarding to him all the merit due to his proficiency in chemical science, I must beg leave to inform him that he has in this instance rather worked "beyond his last." There is not a dyer, weaver, or tailor, who has read the above quotation, but must laugh at its absurdity, and ridicule the pretensions of "Chemicus" to an acquaintance with the cloth business. As one of the last-mentioned class of tradesmen, and qualified by a nearly 20 years' practice in cutting up black and other cloths, to be a competent judge of its qualities and dyes, I beg to give a much more simple test whereby to distinguish a piece-dyed from a wool-dyed cloth, without the knowledge of chemistry. It depends, however, on one condition, which is, that the person be furnished (not with acid, phial, and cork, but) with *eyes* to *see*. With the visionary organ, therefore, let any one just examine the *list*, and if it be of a different colour from the cloth, he may be assured it was dyed in wool, and *vice versa*. But "Chemicus" writes as if genuine black dye was a proof of the cloth being wool-dyed, and, consequently, as if there were no *piece*-dyed black cloth of *permanent* dye. To convince himself of his ignorance on this subject, let him go to any extensive woollen-draper's warehouse, and it is a hundred to one if he sees a piece of wool-dyed black cloth amongst the whole stock; for the fact is, there is scarcely any such thing manufactured; and what attempts have been made to produce such an article, have failed as to the dye. I have seen wool-dyed black cloth; but so far from the colour (as "Chemicus" rather unphilosophically calls it) being good, it has hardly appeared to *be* a black. The fact is, although a *piece* of cloth can be dyed from other grounds (as your correspondent rightly observes) an indigo is the only one to warrant it standing. But there is no need of dyeing the wool to make it answer the purpose; and if "Chemicus," or any one else, wishes for a black cloth of lasting dye, he must have a *fine* one, as coarse cloths are dyed in general at less expense. But as it is the interest of a tailor to keep good and warrantable cloths, and he generally depends on the house he deals with for their quality, none can do better than trust to his *tailor for a good coat*.

R. M.

Chard, Feb. 20.

EXPERIMENTS ON THE NATURE OF HEAT.

(In Continuation from page 278.)

Sir,—Having shown in my last that friction does not evolve heat—that it merely excites chemical action—I proceed to show that friction may be so managed as to *prevent* the evolution of heat, by retarding chemical action.

If we take a small quantity of that useful substance called Roman cement—if it is fresh and of good quality—if it is tempered with water to the consistence of plastic mortar, and then allowed to repose, it will solidify in a few minutes, become warm, and continue warm for a considerable time.

If, however, instead of allowing the *whole* of it to repose, we subject a portion to friction, by rubbing it in a mortar, that portion will not solidify; it will not become warm till the friction ceases, because the chemical action is suspended by friction. If we allow this portion to repose, chemical action ensues, the cement solidifies and becomes as warm as the first portion.

Here, then, we see friction is made to *retard* the evolution of heat. Mere motion must, therefore, appear inadequate to acount for heat evolved mechanically; and how insufficient, then, is it to account for heat and light evolved che-

mically—for such intense heat and light as are evolved on the mere contact of a single drop of a cold oily fluid—chloride of nitrogen, with a drop of cold oil of olives, or of turpentine? For to this terribly-explosive mixture we have neither imparted heat, nor friction, nor condensation, nor motion of any kind! We have a pure exhibition of an electrical discharge; we have instantaneous decomposition of the substances; an evolution of latent heat and light; a recomposition of the elements in other forms, requiring less latent heat and light, which, in every form of matter with which we are acquainted, seem to be component parts, and capable of being exhibited as electric matter in many cases.

At a future time I may send you some more experiments on this subject; but having shown that heat is an element, and not mere motion, in my next I shall enter upon a more interesting subject to mechanics, by endeavouring to show the nature of the combination of heat in steam.

I am, Sir, your obliged servant,

C. M.

P. S. In the last paragraph of my last communication, please to read—*larger* spindle, for *longer*.

HINTS FOR THE PACKING UP OF MACHINERY, AND PRESERVING IT IN WORKING ORDER.

(Extract from a Letter from James Watt, Esq., of Soho, to John Barrow, Esq., of the Admiralty.)

"Before sending off the materials of engines, the bored or turned cast iron parts are all well greased, and the latter wrapped with rope-yarn, and the outside of the castings receive a coat of oil paint; the polished wrought iron work is well greased and packed in boxes with dry saw-dust. The precautions do not, however, prevent rust for any great length of time: this was experienced in the materials of his Majesty's steamer, the Alban, which we delivered at Deptford-yard, in May or June, 1826; but the vessel not being ready, the boxes with the wrought iron goods were deposited in what appeared to be a dry store-room, and, as far as I recollect, the saw-dust removed. On proceeding to erect the engines, some six months afterwards, the wrought iron work was found to be much corroded by rust, and the repolishing and refitting was attended with considerable expense and loss of time. We find also that in our hands here, when similar materials are laid by for any length of time in the driest rooms we have, they require repolishing. This would be the case if the engines were erected, but we do not think the expense incurred in keeping the parts in order would be much increased;* indeed, I have adopted this plan myself in an iron work belonging to me, where I have had occasion to increase the power without the hope of letting it out in the present time. * * * If the engines are not to be erected, the boxes should be immediately opened, the saw-dust removed, and all the wrought iron work well cleaned and fresh greased. It should be kept in a dry storehouse, and, if possible, in one occasionally heated; the cylinders, air pumps, &c. should also be cleaned out and fresh greased, and all the castings, as well as the boilers, should be put under sheds, to protect them from the wet, &c."

IRON AND STEEL IMPROVED BY BEING BURIED UNDER GROUND.

An eminent London cutler, Mr. Weiss, of the Strand, to whose inventions modern surgery is under considerable obligations, has remarked that steel seemed to be much improved when it had become rusty in the earth, and provided the rust was not factitiously produced by the application of acids. He accordingly buried some razor-blades for nearly three years, and the result fully corresponded to his expectation. The blades were coated with rust, which had the appearance of having exuded from within, but were not eroded; and the quality of the steel was decidedly improved. Analogy led to the conclusion that the same might hold good with respect to iron, under similar circumstances; so, with perfect confidence in the justness of his views, he purchased, as soon as an opportunity offered, all the iron, amounting to fifteen tons, with which the piles of London Bridge had been shod. Each shoe consisted of a small inverted pyramid, with four straps rising from the four sides of its base, which embraced and were nailed to the pile; the total length, from the point, which entered the ground, to the end of the strap, being about sixteen inches, and the weight about eight pounds.

The pyramidal extremities of the shoes were found to be not much corroded, nor indeed were the straps; but the latter had

* The meaning is here somewhat obscure; but we understand it to be, that the expense of keeping an engine in good working order, by having a person to attend to it, and working it occasionally, is not much more than the cost of repolishing and refitting.—Ed. M. M.

become extremely and beautifully sonorous, closely resembling in tone the bars and sounding pieces of an oriental instrument which was exhibited, some time since, with the Burmese state carriage. When manufactured, the solid points in question were convertible only into very inferior steel; the same held good with respect to such bolts and other parts of the iron-work as were subjected to the experiment, except the straps: these, which in addition to their sonorousness, possessed a degree of toughness quite unapproached by common iron, and which were, in fact, imperfect carburets, produced steel of a quality infinitely superior to any which, in the course of his business, Mr. Weiss had ever before met with: insomuch, that while it was in general request among the workmen for tools, they demanded higher wages for working it. These straps, weighing altogether about eight tons, were consequently separated from the solid points, and these last sold as old iron. The exterior difference between the parts of the same shoe, led, at first, to the supposition that they were composed of two sorts of iron; but, besides the utter improbability of this, the contrary was proved by an examination, which led to the inference that, the extremities of the piles having been charred, the straps of iron closely wedged between them and the stratum in which they were imbedded must have been subjected to a galvanic action, which, in the course of some six or seven hundred years, gradually produced the effects before recorded.—*Chronicles of Old London Bridge.*

Works on Heat.—B. H., in reference to a remark of Dr. Lardner's, that his work on heat is the only *separate* treatise on that subject which has yet appeared, expresses his surprise that all recollection should seem to have been lost of the excellent treatise by the late Professor Leslie, entitled "An Experimental Inquiry into the Nature and Propagation of Heat," published in 1804. He states that there was a still more recent work on the same subject, in one volume, by Dr. Thompson, published in 1829. This work of Dr. Thompson's is also referred to more at length in a letter from Mr. Rutter, which we shall insert next week. A fourth correspondent (A Templar) reminds us of another distinct work on heat, which was published some dozen or fifteen years ago, by a Mr. Bumpus, barrister. (*Query*, the present Serjeant Bumpus?)

Public-House Finery.—The expense incurred in the fitting-up of public-house bars in London is almost incredible, every one vying with his neighbour in convenient arrangements, general display, rich carving, brass work, finely-veined mahogany, and ornamental painting. The carving of one ornament alone, in that of Mr. Weller, the Grapes, in Old-street-road, cost £100; the workmanship was by one of the first carvers in wood in London. Three public-houses, or rather gin-shops, have been lately fitted up in Lamb's Conduit-street, at an expense, for the bar alone, of upwards of £2,000 each.—*Loudon's Encyclopedia of Cottage, Farm, and Villa Architecture.*

Copper Bottoms.—H. M. S. Prince Regent has been coppered on one side with copper as it comes from the rollers, and on the other with copper steeped in very strong brine. It is an experiment merely to try if the metal undergoing the latter process will not yield better and become more pliable to fix on, without losing any thing in fitness or durability. The Hyacinth sloop, recently returned from the West Indies, has had a thorough repair. A small alteration has been made by coppering the whole of the keel instead of using lead as heretofore; and also using copper up the stern, and having very thick copper plates fixed in the hause-holes. These last are to prevent the wear upon the lead by the chain cables, it being found that the constant friction soon wastes it away. The Hyacinth is, it is believed, the first man-of-war so done.—*United Service Journal.*

Infant Labour.—"A Country Reader" acquaints us that in his part of the country (Nottinghamshire) "a great many children are employed in the hosiery business, of even tenderer years and for more hours each day than at any of the cotton mills," and he asks—"whether they are not equally deserving of legislative protection?" Our benevolent correspondent is evidently not aware that the late parliamentary inquiry embraced the whole of the principal trades in which children are employed, and this of hosiery among the number. It is to be presumed, therefore, that any measure of relief which may be adopted will be equally comprehensive.

Calculating Machines.—Sir, I beg to inform your ingenious correspondent "ϕ μ" (p. 378) that I have projected a machine for calculating, the motion of which is derived from the properties of the logistic of logarithmic spiral, which is the curve he refers to as a relation of the loxodromic spiral. My motion is not, however, produced in the same manner as that of your worthy correspondent; and I intend shortly, with your permission, Mr. Editor, to lay a description of my project before your readers.—I am, yours &c. S. DOWNING. March 11, 1833.

INTERIM NOTICES.

Mr. Ogle's letter shall certainly have a place; it would have appeared this week had it been sent in time.

We do not think the "Plan for Establishing a L. P. S." would lead to the desired result; and, therefore, decline the honour of initiating it.

"Gratuitous Scientific Lectures" is an advertisement.

"Candidus's" letter is unavoidably deferred.

C. W.—The irregularity complained of arose from the very late period of the month at which his last communication came to hand; we should have received it at least four days earlier.

Communications received from ϕ. μ.—B. G.—A Canadian.—Philalgebra.—Mr. T. V. Robson—J. B.—Mr. Rutter.

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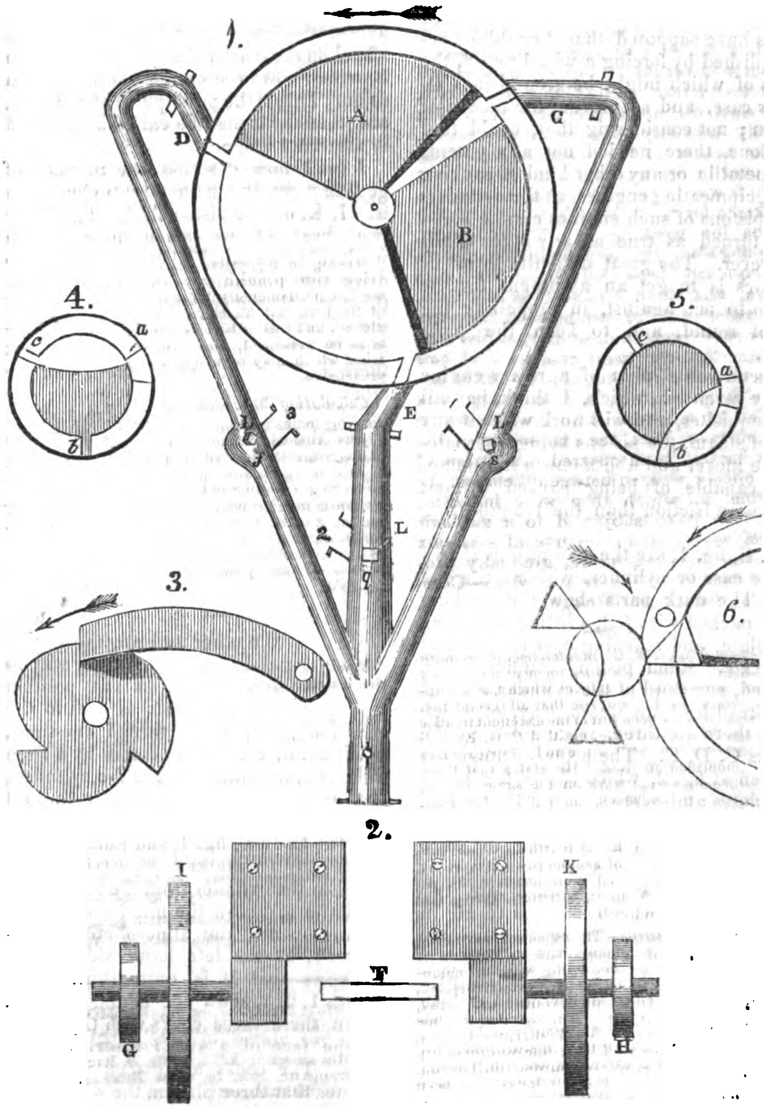
MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 502.] SATURDAY, MARCH 23, 1833. [Price 3*d*.

GRAHAM'S ROTARY STEAM-ENGINE.



GRAHAM'S ROTARY STEAM-ENGINE.

Sir,—Since the time of Watt's great improvement in the steam-engine, many have been the methods proposed to construct an engine in which the steam shall act in a rotary manner instead of a reciprocating one, and in which the crank and fly wheel may be dispensed with; but nearly the whole of the inventors of such plans have supposed that it could be accomplished by forcing a wheel round, the parts of which might be ground into an outer case, and so prevent the escape of steam; not considering that, could that be done, there needed not any patents for metallic or any other kind of packing for reciprocating engines, as the cylinders and pistons of such engines can be bored and turned as true as any other kinds whatever. The great difficulty in rotary engines is to get an abutment for the steam to act against, in propelling the wheel round, and to keep the parts tight.

I send you a plan of a rotary engine of my invention, which, I think, has all the requisites, and will work without any loss of steam, the pistons being alternately the mover and abutment to the steam, and capable of being packed without any more friction than the reciprocating engine.

A, B, fig. 1, are the two pistons shown in the case or cylinder, without the end on. The dark parts show the packing plate packed with felt, a little larger than the plate, and reaching over the joint at the axle. Each piston occupies, when packed, one-third of the cylinder, all but the breadth of one steam way, of which ways there are three, represented by the letters C, D, E. The pistons fit together as seen at fig. 2, which shows the packing-plates and screws, and a strong pin, F, one-half of which goes into each piston at the axle, and allows one to move whilst the other is standing still. At the ends of the piston axles are two strong ratchet wheels, marked G, H, in fig. 2, and one shown in fig. 3, with three notches cut and a pall just fallen into one of the notches, corresponding with the piston; so that when one of them has passed one-third round the cylinder the pall falls into one of the notches and prevents it from running back, whilst the other piston moves; and so on alternately. Suppose the pistons standing as in fig. 1, E is open for the last steam to escape, and C open to the boiler; the steam turns the piston A until it pass the way D at its packing plate, when a notch on the ratchet wheel allows the pall to fall and prevents its return. The steam way C is now opened to allow the steam to escape, and the way at E opened to the boiler; the steam now turns the piston B till it passes the way C, when the pall on its axle falls into a notch in the ratchet wheel on the end of the axle of the piston B, which now becomes the abutment, and so on. This is the principle of the engine, and thus far it may be called a detached or alternate motion.

I will now describe *one* method of getting a continuous rotary motion from it. I, K, on the piston shafts, fig. 2, are two wheels of twenty-four teeth, which work into two other wheels on a shaft to drive the machinery and other work; these wheels are two-thirds of the size of the wheels on the piston shafts; consequently they have sixteen teeth, but there is only eight cut in each, and the other part of the wheel cut away; one set of eight teeth works into the wheel I, and the other on the other half into the wheel K, so that I turns the shaft half way round and leaves it in a right position for the wheel K to turn it the other way, when it is in a right position to be turned by wheel I again.

Fig. 4 and 5 present enlarged views of what I call a three-way cock, in which *a* shows the way to the cylinder, twice the size of the other two; *b*, the way to the boiler; and *c*, the eduction, or way to the condenser. When in the position shown in fig. 4, the steam is sent to the eduction pipe; when turned one-third, as in fig. 5, the steam comes by *b* from the boiler, and through *a* to the cylinder; but turn the cock one-third more and all the three ways are shut. I place three such cocks at L, L, L, fig. 1, and putting them into the position marked *s*, signifying steam going to the cylinder from the boiler, and the letter *q*, below the middle cock, signifying open to the atmosphere or condenser *f*, at the left hand side of fig. 1, shows that it is quite shut. The figures 1, 2, 3, show the eduction pipes. I turn these three cocks with three pins on the face of a small wheel without teeth. The cocks are placed in such a manner that three pins on the wheel turn each cock at the same time, but they may be turned from the first one by pinions

on each shaft. The wheel that drives them must turn once every time the pistons have made a revolution. It will be perceived, on inspection, that the two wheels I, K, turn the working shaft once and a half every time they have made one turn in the cylinder.

Fig. 6 shews one of the cocks with the three irregular triangular wings to turn it one-third, as the pins would only turn it one-quarter were they not made in this form. The pin is marked on the side it commences to turn the cock, fig. 6.

I am, Sir, yours truly,

Jos. Graham, Rope-maker.

Durham, March 5, 1832.

ON LIGHTING SMALL TOWNS WITH GAS.

Sir,—I feel very grateful to "C" for the notice he has taken of my little treatise on gas-lighting. I begin to hope it will prove of some utility in directing the attention of the public to this interesting and important subject. Had "C" bestowed on it unqualified praise, I should have been less satisfied, because I perceive he has much to learn in reference to gas operations, and he is not, therefore, the most competent person to act as censor. My little book, I am thankful to say, sells well. I expect it will soon come to a third edition. It was published without any view to profit: my sole object, throughout all my experiments, inquiries, and observations, has been to elicit truth, and to assist in its more general diffusion.

"C" is strong in his own opinions. He has a right to be so. "C" has his partialities—let him enjoy them. I have mine—but what has the public to do with these? The only question of interest to the public is—which is the most effective and the most economical plan for lighting a town with gas? I have no wish to make "C" dissatisfied with his own views. If he can get orders to light twenty small towns, or large ones either, I should rejoice at his success. I hope, however, he will guarantee them good gas at a cheap rate, yet leaving a sufficient profit to remunerate the proprietary. I can assure "C" he is a long way behind in the practice of gas-making. If he disbelieves me let him come to Lymington and judge for himself. Should he, on inspection, turn out to be a gentlemanly sort of man, I will set before him a good dinner and a bottle of port—vintage, 1812.

Now to the business in hand. "C" complains that I have not mentioned Mr. Winsor. Did he expect a history of gas-lighting in a shilling pamphlet? Mr. Murdoch was the inventor, and to him is due the praise of originality.

Can "C" deny that in very large establishments gas *is* purified by means of a mixture of lime and water? I have stated the fact without offering any opinion as to its being the best method. It is mentioned before the dry-lime process of Philips, not because I think it better, but for the very obvious reason of its employment being anterior in point of time. My little work was intended for the public, not the scientific. It was not necessary that I should undertake to instruct the public in the whole art and mystery of gas making. To give them a general idea of the process was all I aimed at. "C" says I am deceived about the utility of passing gas through water. He had better have said nothing about it, for he has exhibited his ignorance of the first principles of chemical science. If "C" will have a little patience, I may, by-and-bye, tell him something to his advantage: men are never too old to learn if they are but willing.

I have said, "It is only within the last few years that gas-light has made any considerable progress amongst the smaller towns!" This remark is fully confirmed by "C," col. 1, p. 388. Why, therefore, does he cast a doubt on its accuracy? If "C" has, in one or two instances, succeeded far beyond his expectations, what are those in comparison to the number of small towns that have been lighted by others during the last four or five years?

Without any extraordinary degree of mental exertion, I think I can guess the small town to which "C" alludes in the note, page 390. But has he only just verified the correctness of his own views after thirty-two years of experiment? Surely here has been both time and labour lost.

At page 389 "C" says, "If at the expiration of three years, Mr. Rutter will furnish the public with a copy of the actual payments and receipts of the Lymington gas company, and a description of its entire apparatus, he will be

conferring a benefit." I will promise no such thing! Three years hence I may have no control over the accounts of the Lymington gas company, and if I should, perhaps I may no more advise their publication than I would those of a private tradesman. A description of its entire apparatus would, I rather suspect, be very acceptable to "C" now: he must excuse me if I do not comply with his request: it would not be fair towards the engineer who designed and erected it. To any respectable individual who wishes to introduce gas into the town in which he resides, I shall at all times have great pleasure in explaining the principle, and in describing the mode of operation of our apparatus. But I see no necessity of giving it any other degree of publicity.

The detailed estimate at page 32, is *not* that which was adopted at Lymington, although it approximates very nearly. Fact and experience, not dependent on the operations at Lymington, but fully confirmed by those operations, support the estimates I have given, all other circumstances being favourable: local distinctions, peculiarities, and disadvantages must never be overlooked.

I wish "C," in disputing, or, as he is pleased to say, "correcting," my tabular estimates, had pursued my jog-trot plan, which a school-boy could comprehend. By calculating tons instead of chaldrons he has mystified the whole matter. The mode of calculation is entirely local: here we buy and sell coal by the chaldron —in other places it is otherwise.

I shall not at present follow "C" through his money calculations. I should have no difficulty in proving their inaccuracy; but as I prefer actual results to mere hypothesis, I must wait a little, and if the shareholders of the company, whose affairs I manage gratuitously, have no objection, I shall be pleased with the opportunity of publicly setting "C" right.

My observations on gas-lighting have given offence to certain parties—and why is this? Simply because I have told the public that which it was the interest of some persons to conceal. I hope "C" is not offended on this account.

My reasons for not refuting "C" by a statement of the cash results of our workings at Lymington, I have already mentioned. I am not willing to let him off easy, however, and I shall therefore quote from my weekly register a few items, just to show him that his own performances constitute no certain guide for others.

To produce 7,428 cubic feet of gas per night, "C" says, page 388, we must "carbonise one ton (twenty-eight bushels) of best coal within the twenty-four hours, which could not be done by fewer than five retorts working at eight hours charges, which is the best."

"C" is mistaken. During the month of December, when, of course, the demand for gas was at its maximum, the average nightly consumption being 7,714 cubic feet, we were working, not five retorts, but two; not at eight hours charges, because that is not the best rate of working. The average quantity of coal carbonised during the twenty-four hours was not twenty-eight, but twenty bushels. The increase in the measure of the coke, as compared with the coal put into the retorts, was thirty-three per cent. The cost of fuel consumed in heating the retorts was not thirty, but seventeen per cent. on the cost of the coal carbonised. The product of gas per chaldron, instead of being, as I have assumed as the datum in my observations, page 33, at 10,000 cubic feet, was 13,860 cubic feet. Now, let "C" get over this if he can! I will tell him a little more at some future day if he is willing to listen. This is no exaggerated statement: I have quoted it because it comes so near to "C.'s" estimate of the nightly demand. During moonlight nights, and when the demand for gas is at its minimum, the cost of fuel will be greater in proportion as the quantity of coal carbonised is diminished: but I am content it should stand at twenty-five per cent. The 3,860 cubic feet per chaldron are all in favour of my estimates: we have gone on improving in our operations in every department. The following are the products per chaldron during February:—

1st week	. .	14,148 cubic feet.	
2d do.	. .	13,608	do.
3d do.	. .	14,508	do.
4th do.	. .	14,652	do.

"C" is an advocate for heating retorts by coke ovens. They may do very well where the stokers sleep all night, and play at marbles or pitch and toss half the day. Coke ovens require less attention than ordinary furnaces, but will they keep the retorts at a uniform tempera-

ture? Impossible. Moreover, it is not in every situation where the coke would be saleable: the present reduced price of coal renders coke a heavy article of sale in almost every gas-work. Why, therefore, make more of it than is absolutely necessary?

Waste of gas, and loss by condensation, is here under five per cent: we have not pumped a quart of the results of condensation out of the mains during six months' operations. How is this to be accounted for, whilst on other works gallons have been pumped out within the same time? Because we send GAS into the mains, not condensable vapour.

The wear and tear of retorts depends on the quality of the metal—the mode of setting them—the construction of the furnaces—the kind of fuel employed in heating them—and the temperature at which they are worked. A uniformly high temperature is less injurious than sudden variations, even if they are considerably lower: but, after all, the only way to estimate the wear and tear of a retort is by the work it has done. It is not how long has it been over the fire, but how many thousand feet of gas has it generated. Did it never occur to "C" that *two* retorts require less fuel to heat them than five? "C" is evidently interested in the erection of gas-works. I am not. I am only desirous of seeing the best and most economical plans adopted.

"C" talks of 6s. 11½d. per 1,000 cubic feet as the cost of gas to the manufacturer. It may be so at ———, but I am happy to say that is not the price at some other works. "Wages actually paid are 5s. per week!" What does "C" mean? A man working a whole week for 5s.! Surely this must be a mistake. Perhaps the man is a parish pauper: if he is he ought to be paid the value of his labour.

I expect Mr. ——— ("C" knows who I mean) will not be much obliged to him for telling me that the retorts at Bridport were burnt out in four months.

I hope "C" will favour your readers with his economic plan for heating hot-houses with gas. "C" is doubtless a persevering man: I wish him success. Let him not, however, conclude that all the world has been asleep on gas matters whilst he only has kept his eyes open. I have not been thirty-two years at it, for a very good reason; but I have seen enough to convince me that in the process of gas-making there has been much that is absurd, and much that stands opposed to the fundamental principles of science.

J. O. N. Rutter.

Lymington, March 18, 1833.

MR. OGLE'S STEAM-CARRIAGE.

Sir,—I should have allowed the remarks on me, in your Magazine of the 9th of March, to pass unnoticed, if I had not thought it my duty to prevent the public from being misled on the capabilities of steam-carriages on the common roads.

When *anonymous writers* use language inadmissible among gentlemen, it is presumed that the reader will feel as little inclined to be biased by such conduct as the person attacked has inclination to notice it.* Such being my opinion, I pass over the personalities alluded to, and shall merely revert to points on which the public has some right to be informed.

In my evidence before the Committee of the House of Commons, I said that our steam-carriage had gone "from the turnpike gate at Southampton, to the four mile stone on the London road, a continued elevation, with one very slight descent, at the rate of 24½ miles an hour, loaded with people." Such, Sir, is the fact; and not once has that vehicle performed that feat, but several times, on that road, and on other lines of road more trying, at nearly as great a rate.

The whole four miles were, in one instance, cleared at the rate of 24½ miles an hour. In another instance, those four miles were cleared in ten minutes. Once, from the first mile stone to the second, the ground wet and soft, the boiler leaking, and other hindrances from the vehicle (being merely an experimental one), that mile was run over in two minutes and six seconds. Sir Gilbert Stirling timed the rate of going in the last mentioned instance. I believe that Mr. C. Bischoff, of Torrington-square, timed us in the second instance; and, unless my memory fails me, Mr. H. Collier in the first in-

* The Editor would hold himself personally to blame if any language of the kind had been admitted into his pages; but on referring back to the article alluded to, he cannot discover a single expression in it which is not, on public grounds, perfectly justifiable.—Ed. M.M.

stance. After the period alluded to in your remarks, that same vehicle went from Millbrook to Otterbourne, a distance of ten miles of very hilly ground, in thirty minutes, and might have been propelled at greater speed if it had been thought proper with several ladies in the vehicle.

Your anonymous writer has continued to observe that "Mr. Ogle has been further pleased to assert, that on a certain wet road, with patches of gravel upon it, he obtained a velocity of between thirty-two and thirty-five miles an hour, and that it might have been continued under similar circumstances. *How long he did* continue it, he does not, however, tell us; neither has he condescended to explain what it was that brought the carriage to a halt when going at so triumphant a rate." The reason, Sir, was very simple, —we had reached my residence at Milbrook: the distance I had ventured to fly at that speed was about half a mile. The Earl of Dundonald has been in the same vehicle at the other end of the village, when an incident occurred at a speed of not more than twenty miles an hour, which, at some future time, I may communicate to the public. With admirable logic your contributor continues—"But if it might, why has the experiment not been repeated at one time or other?" The inferential assumption that it never has been repeated, is best refuted by stating that the vehicle now at the Bazaar in King-street, with from sixteen to twenty persons on it, and much luggage, went from Knutsford to Hoo-green, three miles and a half, in *five minutes and a half*—a fact notorious in that neighbourhood—and it might have been cleared in much less time. Mr. C. Bischoff, Mr. Margary, of the Lord Chancellor's Principal Secretary's Office, Mr. Heslam, several coach-proprietors, and coachmen were on the vehicle timing her! After such testimony, I should be forgetful of what is due to myself if I were to animadvert on the language of your anonymous contributor.

In Mr. Gordon's work on Elemental Locomotion, that gentleman quotes the corroborating testimony of Mr. M'Niel, the civil engineer, to which no reference is made in the attack on me!

When, Sir, in my evidence I said that "we had beyond all question the power to propel vehicles of any weight, at any required speed," every sane person would conclude that such assertion was limited to the weight required for the general purposes of transit, and "any required velocity" to have the same relative meaning. I feel certain that every member of that committee present so understood it.

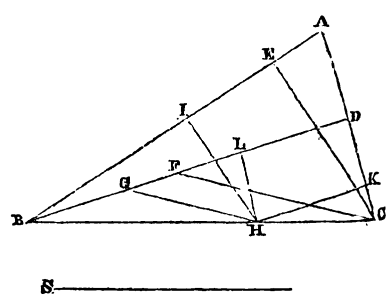
I have avoided falling into the species of controversy of which the attack on me is a feeble specimen, lest the simplicity of facts might be obscured. As you declare "*Truth* to be your *sovereign lord and master*, and that, come what may, *him* you will faithfully serve," I conclude that this letter will be inserted in your Magazine. Many other *facts*, which are of equal importance, might be stated, and which might obtain as little credence as the speed attainable on fair opportunities.

Whatever agonising struggles may be made to crush the adoption of steam-carriages on common roads, they must prove abortive, as speed, safety, and durableness are attained: capital and industry are only required to spread them over the kingdom; and I, after some experience, venture to affirm that *twenty miles* an hour are to be cleared between London and Edinburgh.

I am, Sir,
Your obedient servant,
NATHL. OGLE.

Burlington Hotel, Cork-street, March 14, 1833.

SOLUTION OF THE FIFTH MATHEMATICAL QUESTION, p. 157.



Question.—To find a point in the base of a given scalene triangle so that the sum of the two perpendiculars drawn from it to the opposite sides may be equal to a given straight line.

Answer by Iver Maciver.

Let ABC be the given triangle, and S

the sum of the two perpendiculars. Draw BD, CE, perpendicular to AC and AB; and let BD 7 CE, make BF = CE and DG = S; join FC, and draw GH parallel to FC, meeting BC in H; then shall H be the required point. Draw HI, HK, HL, perpendicular to AB, AC, BD. By similar triangles, FC : GH :: FD : GL and FC : GH :: BC : BH; hence BC : BH :: FD : GL. Again, by similar triangles, BC : BH :: EC : HL, but EC = DF ∴ BC : BH :: FD : HI; hence GL = HI ∴ GD = GL + LD = HI + HK = S.

Cor. 1.—When S 7 BD, or less than EC, the problem is impossible.

Cor. 2.—If BD = EC, and, consequently, the triangle ABC isosceles, then it may be easily proved that the sum of the perpendiculars HI + HK will always be equal to BD, H being any point in the base whatever.

I. M.

DR. LARDNER ON HEAT.

Sir,—You have spoken in terms of just commendation, page 365, of Dr. Lardner's recently published treatise on heat. It is an elegantly-written work, and no trifling praise for it is to say, that it honestly deserves a place on the same shelf with Herschel's Introduction to the Study of Natural Philosophy.

Rather too much stress has been laid on what the Doctor says about there being no separate treatise on heat until this appearance. Strictly speaking, it is doubtless correct that the phenomena of heat have not before occupied a distinct volume. Let it not, however, be forgotten that Dr. Thompson, in 1830, published his outline of the science of heat and electricity; and if the former subject is not limited to a separate volume, it occupies 341 8vo pages. With this masterly work before him, I think it unfair in Dr. Lardner to say that 'heat has been left to form a chapter of chemistry, or to receive a passing notice in treatises on general physics.'

That Dr. Lardner had no objection to avail himself of Thompson's labours, is sufficiently apparent. Why, therefore, did he include the work under the general description of 'a chapter of chemistry,' or 'a passing notice?' Dr. Lardner's 'treatise' is quite as much one or the other of these as is Dr. Thompson's.

Dr. Lardner has done well; but if he were not quite so exclusive, he might have done better. Many things that occupy a considerable space in his treatise, could have been spared without being missed, and their places might have been supplied by more important matter. With almost all that the Doctor has written I am, in common with others, pleased; but I cannot conceal my disappointment that so much has been omitted.

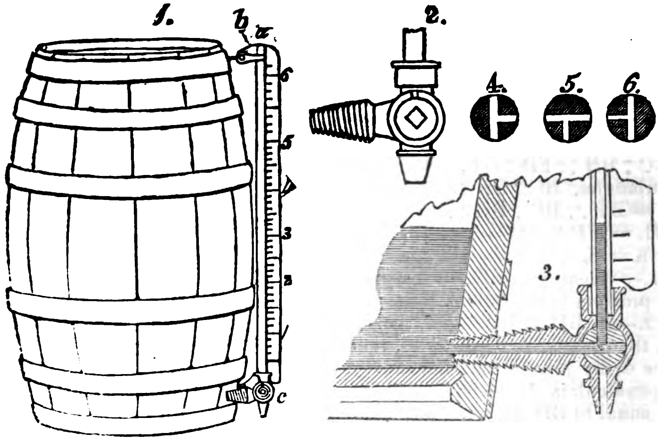
One instance shall suffice. It was, I think, quite natural to expect, in a treatise on heat, some notice of Daniell's pynameter. It is unquestionably the best, if not the only pynameter that is known in this country as applicable to practical science—and yet there is not, I believe, the slightest allusion to it throughout Dr. Lardner's work, whilst others are described at some length. For many years it has been known that our information relative to the temperature that attends a variety of familiar phenomena,—the fusing of metals, for instance—was exceedingly vague and unsatisfactory. Among other absurdities it has been a commonly received notion that the temperature at which iron melts is equal to 21,637° of Farenheit's thermometer! Now the same authorities inform us that iron is red in twilight at 1050°, but to melt it requires an elevation in temperature of 20,587°! Is there not in this something palpably at variance with common sense? What idea can we form of a temperature that is 100 times hotter than boiling water, and more than 30 times hotter than boiling mercury?

Professor Daniell has constructed an instrument that he calls 'a New Register Pynameter for measuring the expansion of solids;' and its principle of action is dependent on the dilatation of metallic bars through the agency of heat. Mr. Daniell has prosecuted a series of experiments which appear eminently calculated to overturn our old-fashioned notions about elevated temperatures. Instead of 21,637° being the melting point of iron, he makes it only 2,786°. It is not my intention at present to pursue this subject further. Those who feel in any degree interested in it, will do well to read Mr. Daniell's paper in the Philosophical Transactions for 1831, part 2; or the Phil. Mag., Nos. 3 and 4, for 1832.

J. O. N. RUTTER.

March 9, 1833.

HENNEKEY'S GAUGE FOR STANDING CASKS.



We extract from the last Part of the "Transactions of the Society of Arts" the following more particular description of the new mode of gauging casks introduced by Mr. Hennekey, of High Holborn, of which we quoted a brief notice from Mr. Babbage's "Economy of Machinery," in our last volume, p. 215. The invention is of such manifest utility, that it can scarcely fail to come into universal use; and has very deservedly obtained for the inventor the honour of the Society's silver Isis Medal:—

"Fig. 1 is an elevation of a cask with the gauge applied to it. Fig. 2 is the cock *c* in fig. 1, on a larger scale; it has three openings, one above, one below, and one in the side; by means of the screw in the latter opening, it is fixed firmly into the cask, as shewn in the section, fig. 3. An upright wooden bar is then secured to the outside of the cask, having a groove *b* in it, corresponding with and being, as it were, a continuation of the upper pipe of the cock *c*; in this groove is placed a glass tube, open at both ends, the lower part of which drops into the upper pipe of the cock, and is fixed there by means of white lead, or any other cement not acted on by spirit or by water; the tube is also secured above by a ring or cap. Parallel with the tube is a brass plate, on which the divisions are subsequently to be marked. The plug of the cock has three ways or openings, as shewn in fig. 3, 4, 5, 6. A tongue or index projects from the plug, indicating the position of one of these ways; it may be seen in fig. 2; the position of which corresponds with that of the sectional view, fig. 3.

"The apparatus being complete as above described, the cock is turned to the position fig. 3, and the cask is filled by a hole at the top. It is evident, therefore, that the liquor will stand in the tubes at the same height it does in the cask, provided the tube is wide enough to avoid any sensible error from capillary attraction: this height is marked as the *b* or zero of the scale. The plug of the cock is then turned to the position fig 6, and a given measure is drawn off, forming the unit of the scale. In the large standing casks the quantity that is found practically the most convenient is five gallons. The plug is then returned to its former position, and the column of liquor in the tube will now be lower than the zero; the point at which it stands is to be marked on the scale as before. Proceeding in this manner to draw off successively five gallons at a time, the whole contents of the cask are thus transferred to the scale, each division of which represents five gallons, and the scale may be numbered upwards or downwards, as may be found most convenient. The scale should not be continued to the bottom of the tube, but should terminate at the point where the dregs are usually found to begin. It is best not to leave a column of liquor constantly in the tube, as a deposit in that case takes place on the inside, which obscures it; when, therefore, any liquor has been drawn off, the plug of the cock should be brought to the position fig. 4, and previously to drawing off a fresh quantity, the plug should be brought to the position fig. 6.

"By the adoption of this method of graduation, the liquor dealer may take stock every day in a few minutes, by merely turning the plugs to the position fig 3, and then reading the number corresponding with the height of liquor in the glass tube attached to each cask.

"Mr. Hennekey also finds these graduated casks to save much time, and give greater precision, in making different liquids to form those compounds which are required by his customers. If, for example, he wants to mix together spirit and syrup in any given proportion, he puts the two liquors into separate casks on the ground floor, and places an empty cask, also graduated, on the platform above, and then pumps from the lower casks into the upper one the determined quantity of each ingredient; he then allows the mixture to remain for twenty-four hours, after which he reads off the quantity, and by comparing this with the previously known quantity of the separate ingredients, ascertains how much has been lost in volume by condensation, and therefore how much additional price must be charged as an equivalent."

HENNEKEY'S CELLAR CANDLESTICK.

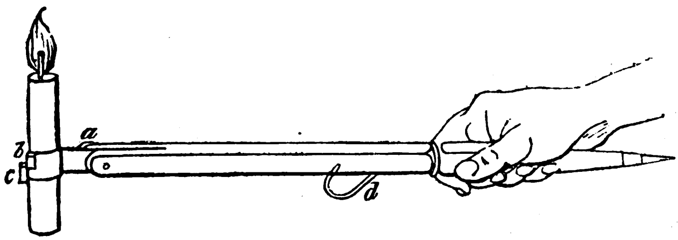


Fig. 3.

Fig. 2.

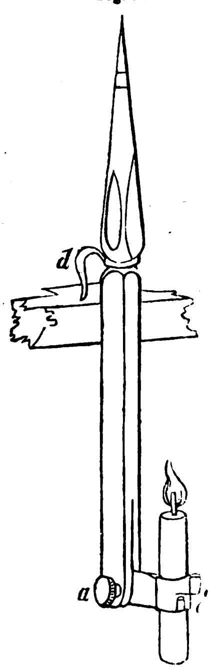
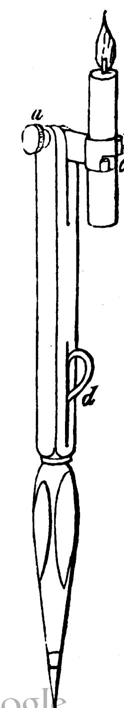


Fig. 1.



Mr. Hennekey has also invented a cellar candlestick of a very convenient and safe description. It is so constructed that it may be used in any position. In fig. 1 it is in a position for being stuck into the ground, it having a sharp iron point for that purpose; the top is cleft, and has a binding screw *a*, to tighten the tin springing candle clip in the suitable position; the clip opens to receive the candle by pinching the two passing curls *b* and *c*. In fig. 2 the candle and clip remain in the same position as in fig. 1, though the stick is turned upwards; now the sharp-pointed hook *d* is pulled out of its recess, and turned so as to hang on a shelf. In fig. 3 the clip is straight with the stick, and it is either held by the hand, or it may be stuck into the wall by its point.

THE MIDLAND COUNTIES RAILWAY.

Sir,—With pleasure I noticed in your very useful Magazine, on the occasion of Mr. Busby having sent you a statement of the performance of a locomotive carriage which travelled last year from London to Brighton, an observation by you, that if engineers and other competent persons would furnish you with reports of similar facts within their knowledge, it would afford to the public much useful information; and in that observation I fully agree.

As a reader of your Magazine from the issuing of the first number, I am firmly of opinion that no work ever published has been of so much benefit to the *world.* I take a wide amplitude; and I am fully justified in so doing, when I call to mind the many luminous papers it contains in the higher class of mathematics, as well as practical mechanics, suiting all capacities, and affording such useful practical information as could be obtained from no other work—all classes having contributed most liberally their meed of knowledge.

Having offered this tribute of praise to the merits of your work, I may be allowed to express an opinion that your strong bias in favour of railways, as a general mode of conveyance (which is strongly exhibited by your remarks on the prospectus of the Midland Counties Railway), may lead many confiding persons into error, and I may say ruin.

The Liverpool and Manchester railway, which in point of celerity has shown such wonders, was projected, not for passengers, but to compete with the canal and river navigations between those towns, and the calculations made by the promoters was, that it would abstract nearly the whole of the traffic from those navigations—at least to the amount of 1,248,000 tons per annum. But what has been the result? Why, that after being at work about two years and a quarter, the whole quantity of merchandise conveyed by that channel, during the half year ending 31st Dec., 1832, was 86,642 tons (exclusive of coal to no great amount), instead of 624,000 tons. It may be asked, how does this arise, since the calculation of 4,000 tons per day was their own? It arises from this circumstance—that wherever there is a water competition, a railway cannot answer for carrying goods. Goods do not require a rapid conveyance. They are now taken from Liverpool to Manchester, there to be warehoused till required by the purchaser for consumption. The same is the case at Birmingham, where may be seen in the canal-carriers' warehouses, sugars and other articles, waiting, not days or weeks, but months, after arrival; and with respect to coals, it is quite impossible that they can pay the railway dues wherever there is a river navigation or canal working in its neighbourhood. This leads me, Sir, to the proposed Midland Counties Railway project, which is stated to be set on foot by the owners of coal-fields in the neighbourhood of Alfreton, in consequence of the unsatisfactory conduct of the canal companies. The coals are to be conveyed by railroad from Pinxton to Leicester, which latter town is, I presume, the intended mart, and to which the Swannington railway, now in part at work, will deliver coals from a more westernly coal-field. This, of course, will form so great a supply as to greatly reduce the price upon coals at Leicester; and as the canal tonnage will no doubt be reduced to keep the present trade, I see no prospect of the midland railway being an undertaking likely either to benefit the subscribers or the public, as it is an undoubted fact, that coals cannot be carried by a railway as cheap as by a canal or river navigation; and if the coals are intended to be for a market beyond Leicester, or the termination of the railway, they must be unloaded into other conveyances, which will materially add to their cost.

With respect to the estimate put forth, and the advantages to be obtained by the railway, I must say the public has seen a measure proposed and executed by the same engineer, which has been a complete failure, though ushered into notice with quite as favourable a programme. I allude to the Cromford and High Peak railway, which cost upwards of 160,000*l.*, —was to pay 11 per cent. on 150,000*l.*, —which has since been completed, and has not paid one farthing to the subscribers. I believe it to be now considerably in debt, and when I saw it in July last, was not doing business enough to pay the ordinary expenses of working it, although the engineer's calculation of trade was 144,400 tons per annum, to

produce a revenue of 16,676*l*., and to shorten the distance from Manchester to the Derbyshire canals no less than 56 miles.

Now, Mr. Editor, I think, after reading these statements, which are facts, it behoves you not to encourage, or to place in such delusive colours, speculations which may answer *certain* persons' purposes, but must ultimately ruin those who are induced, by *your* picture, to embark in them.

I am, Sir, your obedient servant,
CANDIDUS.

Feb. 28, 1833.

Remarks.

We insert the preceding communication from the same regard for truth by which we presume the writer of it to be actuated, but without feeling that it invalidates in the least the grounds on which we recommended the Midland Counties' Railway to the favour of the public. A very few words will, we think, suffice to show that we have good reason for adhering to that recommendation.

"Candidus" asserts that the "Liverpool and Manchester Railway was projected, *not for passengers*, but to compete with the canal and river navigations between those towns." Now, the reverse of this was clearly shown to be the fact, in our notice of Dr. Lardner's paper on Inland Transport (p. 90, present volume).

The quntity of goods conveyed by the Liverpool and Manchester Railway has not certainly been hitherto so great as was anticipated; but to infer from this, as "Candidus" does, that "wherever there is a water competition, a railway cannot answer for carrying goods," is to found a general conclusion on the narrowest premises imaginable. It is matter of notoriety that the conveyance of goods by the railway in question has never yet had fair play, owing to the imperfect construction of the steam-carriages employed upon it. It is such a railway, besides, as furnishes a very indifferent specimen of what railways are really capable of accomplishing.

"Candidus" further asserts that "it is an undoubted fact that coals cannot be carried by a railway as cheap as by a canal or river communication." How "undoubted?" Where is the proof? The project of the Midland Counties' Railway is founded on calculations which go to prove that coals *can* be carried on such a railway at a cheaper rate than they now are by the Trent and Soar navigation; and the accuracy of these calculations "Candidus" does not offer to impugn.

But we are told that "the public has seen a measure proposed and executed by the same engineer, which has been a complete failure, though ushered into notice with quite as favourable a programme," namely, the Cromford and High Peak Railway. If the reader will refer back to the *Mechanics' Magazine* for the 2d of June last, he will find there a letter from Mr. Leonard, the Superintendant of that railway, which is altogether at variance with this statement of our anonymous correspondent. So far from its having proved "a complete failure," Mr. Leonard states, that "since the completion of the work a very steady and constantly improving transit has been established;" and that "the proprietors feel the fullest confidence in the ultimate success of the undertaking."

"Candidus" closes his letter with a piece of advice to us, which, under all the circumstances, might, we think, as well have been spared. If we have exhibited the advantages of railway conveyance in "delusive colours," it remains at least to some other person than "Candidus" to show that we have done so. Not one statement made by us has he invalidated. We will not dispute that it may "answer *certain* persons' purposes" to exaggerate the advantages of railways—any more than that there are others whom it may suit equally well to underrate them at the expense of both truth and candour; but for ourselves, we deny that we have any purpose to serve which would not be injured by the slightest suppression or perversion of the real facts of the case.—ED. M. M.

WINES AND SPIRITS.

Gin.

Sir,—Few persons, comparatively, are perhaps aware of the vast quantity of spirits consumed annually in the United Kingdom. The subjoined statement will give a general idea on this subject.

In 1830, there were imported and retained for home consumption:—

3,658,958	gallons of rum, estimated at proof.		
1,274,803	ditto	brandy	— —
30,799	ditto	Geneva	— —
Total 4,964,560			

During the year ending the 5th of April, 1832, there were charged with duty,

In England . .	6,824,462	gallons of spirit.
Scotland . . .	5,718,597	ditto
Ireland	8,560,442	ditto
Total	21,103,501	

To these statements may, I think, be added 1,250,000 gallons, estimated at proof, of contraband foreign spirits, which find their way hither from the Norman Isles and the coasts of France and Holland. The reduction of the duties on British spirit has sensibly diminished illicit distillation in Scotland and Ireland. It is not, however, entirely prevented, nor is it probable it will be whilst the present system of collecting the duties continues. In round numbers, we may assume, as a very low estimate, 1,000,000 gallons as the products of private stills in the three kingdoms. There is yet another source whence spirit gets into the hands of the public without payment of duty. I allude to the tricks that are practised in some distilleries, whereby the exciseman is deceived and the revenue laws evaded. It would, in the absence of data, be mere guess-work to state any supposed quantity under this head. I therefore let it pass.

If the foregoing items be collected into a condensed form, we shall have, as the average annual consumption of spirits in the United Kingdom, say

	4,964,560	gallons of	foreign spirits.
	21,103,501	ditto	British —
	1,250,000	ditto	contraband —
	1,000,000	ditto	illicit —
Total	28,318,061		

I have no means of ascertaining the quantity of British spirit that is annually rectified and converted into gin, brandy, and other compounds; probably it is not less than 15,000,000 gallons.

A lengthened description of the distillatory process would occupy too much space on the present occasion. I will, during the progress of these observations, devote a separate paper to that interesting subject. It might not, however, be improper to remark, that the businesses of a distiller and a rectifier, although in some respects the same, are perfectly distinct. A rectifier is, in practice, a distiller; but a distiller cannot be, in a legal sense, a rectifier. The businesses of distiller and rectifier cannot be carried on by the same person, at the same time, and on the same premises, without the forfeiture of very heavy penalties. The former is technically called a malt-distiller, because malt is the staple commodity that he employs in the manufacture of spirit. The latter is a "rectifier" and "compounder," inasmuch that he receives the spirit from the distiller, and by rectification, dilution, and sweetening flavours, colours and reduces it to suit the tastes of his customers. Spirit, when unmixed with flavouring ingredients, is termed "plain spirit;" when it is manufactured into gin it becomes a "compound." Irish and Scotch plain spirit is popularly denominated whisky. The products of the malt distilleries in England may with equal propriety be called whisky. I am not aware that spirit manufactured in England has any other name than that affixed to it by law, viz. plain spirit. Whisky denotes more the appearance than the properties of spirit. It is, I believe, derived from an Irish word, *uisge*, which signifies water, whence comes also usquebaugh.

Gin is evidently an abbreviation of Geneva.

London gin, as manufactured by the eminent rectifiers of the present day, is a wholesome and delicious spirit. It must, however, be remembered, that I here refer to "raw gin," that is, gin as it comes from the still, and before it is reduced, sweetened, and flavoured. There are doubtless many thousands of individuals who have passed their whole life in the metropolis without tasting a glass of genuine gin. This may seem strange; but it is not more strange than true. The greater proportion of the gin that is consumed in London is "made up," as it is technically termed, into cordial gin. And why is this? Because it yields in this shape a much greater profit. We shall see, by-and-bye, a little of the cordialising system. It must come under our notice in my next paper.

To those who drink spirits by drams, that is, without dilution, sugar and water are incalculable blessings. To sugar and water, no doubt, they are in some respects indebted for the prolongation of their existence. For their sakes, therefore, these simple ingredients cannot be too extensively employed. Not so as respects private families; they ought never to purchase cordial gin.

In Vino Veritas.

March 14, 1833.

NEW PUBLICATIONS CONNECTED WITH THE ARTS AND SCIENCES.

The Penny Cyclopædia.

All the world knows that since the commencement of this fortunate year 1833, the "incorporated" Society for the Diffusion of Useful Knowledge have been engaged in furthering the great work of the enlightenment of the working classes, by sending forth a new circle of all the sciences in weekly penny Numbers. Every body also knows, or might have known, that this production has been announced as being in preparation for several months; that the Society have pledged themselves to continue it regularly until the whole range of human knowledge is run through; and that they estimate the time this will take at the exceedingly short period of eight years! Its appearance was harbingered by many an extraordinary flourish of trumpets; and it was mysteriously whispered that the whole Committee of the Corporation, whose names figure at such an awful length on the outside of all their publications, were busily and anxiously engaged in preparing for the task of getting out the grand work; and that, not satisfied with throwing the *heavy* weight of all their own talents into the scale, numberless paid professionals had likewise been enlisted, at a rate of guineas per sheet quite beyond the resources of any ordinary penny periodical. We are afraid, however, these whispers were like many others—not exactly true; and that the learned gentlemen of the Committee have, as usual, nothing to do with the matter beyond lending their names to the monthly wrapper; and that the professionals have not received sums so enormous for their services as to induce them to "outdo all their former outdoings," inasmuch as the most extraordinary thing about most of their articles is—their extraordinary inferiority.

Notwithstanding the length of time the Cyclopædia has been in preparation, it seems, after all, to have been begun without any settled plan. From the first Number, indeed, it would appear that one had been determined on—in regard to the scientific portion at least—for, under the head "Aard-vark," which is the first in Zoology, we are told:—

"**In a work, like the Penny Cyclopædia, where knowledge is communicated under separate heads, arranged in alphabetical order, it is an unavoidable consequence of the general plan that terms must be occasionally employed which have not been previously defined, and of which, in a regular treatise, the explanation would necessarily precede the use. To obviate this inconvenience as much as possible, it is proposed, without entering into the minute details of the subject, or anticipating information which properly belongs to a different part of the work, to give a brief explanation of such terms as they occur; so that the general reader may be enabled to comprehend their meaning and import, without the trouble of referring to other sources.**"—p. 1.

All this is reasonable enough, and the explanation of zoological terms which follows, sufficiently clear; but the worst of it is, that the paragraph, which seems on the face of it to bear a general application, is totally lost sight of no farther onward than p. 14, where the first article on Music, "Abbreviation," occurs. Here we are suddenly plunged into an ocean of minims, crotchets, semibreves, quavers, semiquavers, and arpeggios, *without one single, solitary syllable of explanation!* while a quantity of musical notes are placed before the reader for his perusal before he has any means (from the work) of knowing what sort of thing a note may be, or distinguishing a bass-viol from a double drum. He is left as much in the dark when he comes to the first article in Botany. Here, however, after receiving the very intelligible information that the flowers of the tree described are "monœcious," he is, in a note, informed that he will find a little "difficulty" in understanding what he is reading about, but that "a complete glossary" of the technical terms used will be given under the article Botany. Here is evidence of a well-digested system! We are told, at p. 1, that technical terms will be explained *as they occur;* but at p. 29, the case is altered, and if we would pluck out some meaning from the scientific jargon there employed, we are told to wait for a few months until we come in due alphabetical order to "Botany." The inference fairly deducible is, that the Cyclopædia, instead of being the result of a deliberate arrangement, is hastily got up in the ratio at which the printer is clamorous for copy.

This is not the only symptom discernible of haste and absence of method. At setting out we are given to understand

that the objects of Natural History will be treated of under their common names, and that their scientific ones will be added in a parenthesis; and one or two articles are accordingly given in this way. The plan thus laid down, however, is very speedily departed from; the *vulgar* name is given in a parenthesis, and the *other* leads the van—so that the cottager who wishes to refer to his penny oracle for information on the fir-tree must first be possessed of the knowledge that the Latin name of the species is "Abies"—the sailor, who would confirm his marvellous stories of the half-vegetable, half-animal sea-nettle, must be aware that in "learned lingo" its appellation is "Actinia"—and the mechanic, who dreams over the notion of one day making his own sugar in the back-woods of America, need not expect to find any notice of the maple under any other head than the very *familiar* one of "Acer." All this seems to show, that if the Society did cogitate deeply over the plan of their great work, their well-meant deliberations did not prosper very exceedingly; or that if, as usual, they left the whole business in the hands of their regular bookmaker, he has been very remiss in his duty.

In another respect they have been equally unfortunate; the quality of their articles is not so astonishingly superior as it ought to be. Political Economy appears to have been delivered over, "without reserve," to Mr. M'Culloch, who has already, under the heads of "Absentee" and "Accumulation," given his readers enough of his *peculiar* opinions to serve them for the whole eight volumes; it costs him scarcely an effort to prove that absenteeism is no evil, and the unlimited extension of individual capital an immeasurable good! The zoological articles are redolent of the wonders seen by Mr. Pringle in South Africa—(that boy will be the death of us—the Society will never be able to double the Cape of Good Hope while he is in their service)—bolstered up by the ornithological experience of Mr. Rennie, at "Lee, in Kent." The geographical notices are extremely dry; that on Abyssinia is very little more than a bundle of hard names; and (wonderful to relate!) that on "Aberdeen" itself is inaccurate! The life of Abernethy is intolerably prosy, and occupied more with dissertation on his peculiarities than an account of the events of his career.

It is in Grammar, however, that the Cyclopædia shines forth pre-eminent! At p. 36 is an article on the "Ablative Case," so full of the most unaccountable and disgraceful errors in every line that it would require a whole Number of the Mechanics' Magazine to do them justice. We are totally at a loss to imagine how such an article could possibly be suffered to appear in a work "under the superintendence" of a Society which includes among its members not only a great number of Members of Parliament—several dignified clergymen and high law-officers (with Lord Brougham at their head), and a host of other gentlemen of liberal education—but also divers *classical masters* in some of our first public schools! The ignorance displayed in it is so intense, that the lowest boy of the lowest form would deserve whipping for it; and yet withal the blundering blockhead who concocted it so plainly shows in every line that he is as proud as a Porson of his achievement, that we must spare a few words to show him up a little.

After a little preliminary flourishing, he tells us that in the Latin language "while the three letters *reg* meant *king*, *reg-is* meant *of or from a king—reg-i, with, in, or near a king—reg-em, to a king*." By a singular felicity, every assertion in these two or three lines is false; the three letters *reg* did not mean *king*, but "the three letters" *rex* (as a reference to any farthing-piece will testify)—*reg-is* meant *of*, and not *from* a king—*reg-i*, neither *with*, *in*, nor *near*, but *to* a king—and *reg-em*, the accusative, merely signified *a king* in the objective sense, and not *to* a king. (Who would say, "I saw *to* the king?) We are told, too, that *pro*, which until now has always been rendered "for," means "before;" and that *de*, which most persons would construe *of* or *from*, in English is neither more nor less than *down from*. But perhaps the richest bit in the whole article, which occupies something more than half a column, is the following. After exposing his utter ignorance in a hundred instances besides those our patience has permitted us to enumerate, our erudite author observes:—

"For fear, lastly, that any of the learned should *find fault with our Latin*, (how could he dream of such a thing?) we will observe that even the little *e* which marks the ablative case, which *e* itself is but the remnant of a longer termination, was

often absorbed by a preceding vowel in the Latin word to which it was attached. Thus, to take *regina, a queen*, they did not say *in reginæ, cum reginæ, ex reginæ*, &c., but *in regina, cum regina, ex regina*, &c."

From this, and the whole tenor of the article, it will be perceived that the learned wight hath no conception of the existence of more than one declension of Latin nouns; and, moreover, imagineth that declension to be the third, taking no thought of the other four. This is plain from his phrase, "the little *e* which marks the ablative case," as though it were a rule of the language that the ablative should end in *e*, and from his adducing the instance of *regina* as an exception, and not dropping the most distant hint that the word belongs to quite a different declension from *rex*. What a pity he did not take *dominus* for his illustration! According to his rule, the ablative would be *dominuse*, and, according to his exception, it is hard to say what it would be; certainly not *domino*, for in that case a "little *o*" would "mark the ablative instead of a "little *e*."

It would take up too much space to anatomise the rest of the article; suffice it to say, it is fully equal to sample, and betrays throughout the same inconceivable ignorance. Yet such is the instruction offered in a work "under the superintendence of the Society for the Diffusion of Useful Knowledge," which is to consist of eight large volumes of such carefully-digested matter. The whole of its contents are, of course, not quite of the quality of the "ablative case" article; but it speaks volumes for the anxiety with which the Committee superintend their Cyclopædia, that now, several weeks after its appearance, that disgraceful article remains uncancelled, and its author—as we gather from a subsequent article, only less disgraceful than its great predecessor, on the "accusative case"—is still retained on the list of its contributors.

The Cabinet Annual Register for 1832. Washbourne.

We think this second volume of the "Cabinet Annual Register," upon the whole, superior to that of last year, and well calculated to confirm the favourable impression which the public have conceived of the undertaking. Its superiority consists, however, rather in a better general assortment of the materials—in the enlargement of two or three departments which had too little space devoted to them last year) (that of Foreign History in particular,) and the curtailment of others which occupied too much—than in a more careful digest of the materials themselves. We regret to say, that the editor seems not, without the need of being admonished that, in a historical work of this nature, the thing to be studied, before all others, is accuracy. Such mistakes in dates and names as the following are at once among the worst that can be committed, and the least to be excused. The Duchess of Berry is stated (p. 122) to have been arrested "at the beginning of May;" she was not arrested till the month of November. The death is mentioned (p. 260) of a "Count Coptal;" the person meant is Chaptal, the celebrated chemist. We are informed that on the 28th of February "Counsel concluded their arguments on the question between the parishioners of St. Saviour's and the London Bridge Committee, when, after some deliberation, the claim of *the latter*, for allowing an opening of 130 feet at the east end of St. Saviour's Church, was granted by the *jury* by a majority of 19 to 3." The claim to the opening was not made by the *latter*, but the *former;* and the tribunal that decided in favour of it was not a *jury*, but a Committee of the House of Commons. In September, "the inhabitants of Furnival's Inn" are stated to have been "alarmed by an extraordinary report from the apartments of Mr. A. Baring, a law-student, particularly fond of trying experiments with gunpowder;" the unfortunate gentleman here alluded to, was the late distinguished Professor of Chemistry, Mr. Barry, who lost his life by the explosion. Akin to these errors of commission, is the frequent omission of facts which are necessary to the complete understanding of the transactions related. It is stated, under "July 26," that "the Court of Inquiry in the case of Somerville commenced its sittings at Weedon barracks;" but it is nowhere mentioned what the inquiry was about, nor how it concluded. In like manner we read of numbers of persons being committed for trial, of whose ultimate fate we are left in ignorance; and of others being executed, of whose previous con-

victions there is no mention. More need not, we presume, be added to show that we have good reason for recommending to the Editor to take more pains in future with the details of his work. We like the plan of it so well, that we should have been glad to have nothing but praise to bestow on the execution; but it concerns alike our own credit as critics, and the prosperity of the undertaking itself, that defects so glaring, and so easily to be remedied, should be thus frankly pointed out.

The Literary Annualist: an Historical Register of English Literature, Novelties in Science, the Fine Arts, Music, the Drama, &c. No. I. To be published Monthly. Hurst.

The design of this new periodical is to give simply a *Catalogue Raisonnée* of "all the books, not absolutely worthless, published during each month, with the size, the price, and the name of the publisher of each, and a brief but satisfactory explanation of the design and contents of every production whose title does not adequately afford this necessary information." There is a numerous class of persons to whom such an undertaking as this, if well executed, would be of the greatest utility; and if the editor will in future adhere more closely to his own plan—that is, give simply the contents of each book, and refrain from sweeping comments, which in the absence of all proof and illustration (for "all extracts are to be avoided") it would be only fair and modest to do—we have no doubt he will meet with ample encouragement.

Rudiments of Music. By David Everard Ford. Westley and Davis.

The simplest and clearest exposition we remember to have seen of the elements of an art which owes its chief difficulty to the needless obscurity which the use of an outlandish jargon, and many artificial conceits, have thrown around it. The Rudiments are accompanied by a separate plate, exhibiting all the musical characters and varieties of notation, which it is the principal business of the treatise to explain.

A better Method to Pulverize Gold and Silver Ores wanted.—Sir, There is a great want of some better method to crush the various metallic ores, and particularly the gold and silver ores of other countries, than that by stamp head now in general use. This method may be very well in a country like England, where steam power is to be attained at an easy rate; but in those countries like America, where but little fuel or water is contiguous to mines, rich ores are often useless, because of this absence of the power to reduce them. The subject is of *immense importance*, and being interested in it, and by no means of a mechanical turn, I have deemed it prudent to solicit, through the means of your columns, information as to any better method to reduce such ores to powder than by stamping. I have heard this is to be done by rolling or by crushing between rollers. Or is there any method of increasing the power of water upon the common water wheel? Or of substituting any better power, where you have a stream, so as to make a stream which, by the common water-wheel, in the ordinary way, lifts six heads of one cwt. each, to lift nine or twelve such heads? Any information on the above points will be highly prized by your obedient servant. ENTERPRISE.

Immense Wooden Bridge.—The model of a bridge is to be seen at the National Gallery of Practical Science, which was constructed of fir, at Terrebonne, near Montreal, and was of no less than 750 feet span. It consisted of a system of trusses in a longitudinal direction, the feet of each being supported from the crowns of the bent arches, which were in thicknesses scarfed together, and thus the feet of the adjoining trusses were supported from the crown of the bent rib immediately thereover, as in a common truss. Owing to the iron washers under the main beams, which received the bolts of the suspending rods, being of too small an area, the bridge sunk four feet in the centre. As this was a fault of construction and not of principle, it was remediable, and larger washers were about to be substituted, for which purpose piles were driven into the river bed, to carry the bridge whilst the work was proceeding; but before it was completed, one of those floods which are of such frequent occurrence in the St. Lawrence, carried away the temporary supports, and the bridge itself was consequently destroyed.

Salt Water Freshening Apparatus.—Dear Sir, Since I forwarded the sketch of the apparatus for freshening salt water, which you was kind enough to insert in your last number, I have found that the pipe for the steam must be in the shape of a syphon, and not as shewn in your engraving; for I find that the motion of the ship, when there is the least wind, would otherwise send the water back into the boilers. There ought also to be a cock inserted in that part of the pipe which is close to the boiler, so that the steam might be turned off when required; for in Mr. Fraser's patent stoves most of the vegetables are cooked by steam. There might also be a pipe led from the condenser to the boiler, so that when the water becomes warm from the action of the steam in the pipe, it could be discharged into the boiler.—I remain, dear Sir, your obedient servant, EDW. WHITLEY BAKER, jun., Old Broad Street. 1st March, 1833.

INTERIM NOTICES.

C. W.—We have not decided against his plan, but wish to have leisure to compare it with the others which have been brought forward.

Mercator next week.

Communications received from Mr. Jopling.—H. Y. S. I.—L.—Truth.—W. J. R.—C. D. S.—Mr. Thomas.—Mr. Robson. Saxula.—Junius Redivivus.—Forge and Foundry.—Aerostaticus.

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

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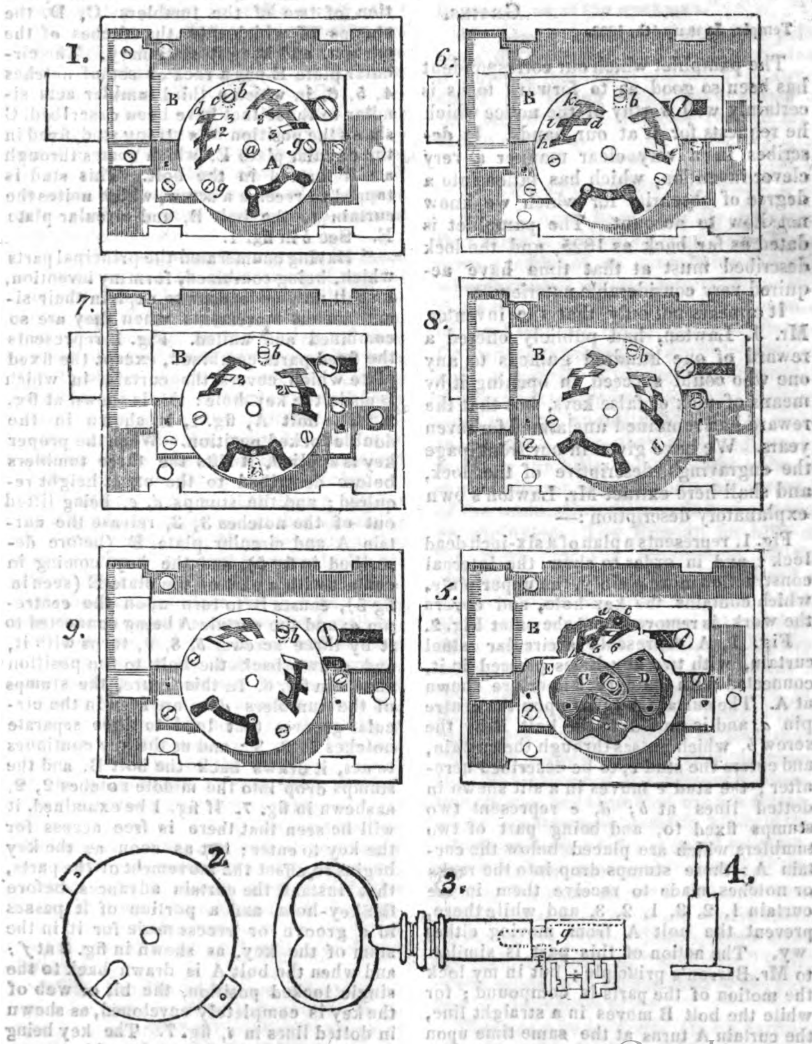
LAWTON'S SAFETY LOCK.



LAWTON'S SAFETY LOCK.

Sir,—I send for your perusal a pamphlet on "Lawton's Patent Lock." As no notice has appeared of it in your Magazine, you will probably think it worth one. It appears to me to be an excellent lock, and I should much like to know where it can be procured, and at what cost. Perhaps a hint to that effect might elicit a reply from Mr. Lawton himself.

I am, Sir, yours, &c.

GRAINS.

Temple, January 5th, 1833.

The pamphlet which our correspondent has been so good as to forward to us is certainly well worthy of the notice which he requests for it at our hands. It describes in a very clear manner a very clever invention, which has fallen into a degree of obscurity for which we know not how to account. The pamphlet is dated as far back as 1825, and the lock described must at that time have acquired very considerable notoriety.

It appears not only that the inventor, Mr. J. Lawton, had publicly offered a reward of one hundred guineas to any one who could succeed in opening it by means of pick or false keys, but that the reward had remained unclaimed for seven years. We have given in our front page the engravings descriptive of the lock, and shall here extract Mr. Lawton's own explanatory description:—

Fig. 1, represents a plan of a six-inch dead lock; and in order to show the internal construction more plainly, the upper plate, which contains the key-hole, and covers the work, is removed, and shewn at Fig. 2.

Fig. 1, A represents a circular steel curtain, with two key-holes pierced in it, connected with the curved aperture shewn at A. The curtain A turns upon the centre pin *a*, and is united to the bolt B by the screw *b*, which passes through the curtain, and enters the stud *c*, to be described hereafter; the stud *c* moves in a slit shewn in dotted lines at *b*; *d*, *e* represent two stumps fixed to, and being part of two tumblers which are placed below the curtain A; these stumps drop into the racks or notches made to receive them in the curtain 1, 2, 3, 1, 2, 3, and while there, prevent the bolt A from moving either wy. The action of this part is similar to Mr. Barron's principle; but in my lock the motion of the parts is compound; for while the bolt B moves in a straight line, the curtain A turns at the same time upon the centre-pin *a*, and consequently it moves in a circular direction. Fig. 3 represents a key; *f* shews a groove formed in the cylindrical part to admit a portion of the steel curtain to enter and move therein, while the key is employed in moving the bolt either backwards or forwards, as occasion may require. Fig. 4 represents the key-pin of the lock detached, so as to give a correct idea of its form, which exactly corresponds with the hole drilled in the key shewn in dotted lines in *g*, Fig. 2.

"Fig. 5 represents a lock with the steel curtain removed, so as to show the position of two of the tumblers C, D, the stumps of which enter the notches of the curtain, and keep it stationary. The circular plate E has a rack or set of notches 4, 5, 6, in which a third tumbler acts similar to those that have been described. C shews the position of a strong stud, fixed in the circular plate E, which comes through a slit formed in the bolt. This stud is tapped to receive a screw, which unites the curtain to the bolt B, and circular plate E. See *b* in fig. 1.

"Having enumerated the principal parts which, being combined, form my invention, I shall now endeavour to explain their simultaneous movements when they are so combined and united. Fig. 1 represents the fixed parts combined, except the fixed plate which covers the curtain, in which is made the key-hole: this is shewn at fig. 2. The bolt A, fig. 1, is shewn in the double locked position. When the proper key is applied, it lifts the three tumblers before described to the exact height required; and the stumps *d*, *e*, being lifted out of the notches 3, 3, release the curtain A and circular plate E (before described in fig 5), and the key coming in contact with a part of the plate E (seen in fig 5), causes it to turn upon the centre-pin *a*; and the curtain A being connected to it by three screws, *b*, 8, 9, turns with it, and draws back the bolt to the position shewn in fig. 6. In this figure, the stumps of the tumblers *d*, *e*, are seen in the circular grooves that lead to three separate notches 1, 2, 3; and as the key continues to act, it draws back the bolt B, and the stumps drop into the middle notches 2, 2, as shewn in fig. 7. If fig. 1 be examined, it will be seen that there is free access for the key to enter; but as soon as the key begins to affect the movement of the parts, that instant the curtain advances before the key-hole, and a portion of it passes in a groove or recess made for it in the stem of the key, as shewn in fig. 3 at *f*; and when the bolt A is drawn back to the single locked position, the bit or web of the key is completely enveloped, as shewn in dotted lines in *i*, fig. 7. The key being once more turned, lifts the tumblers a se-

cond time, and the stumps *d, e*, pass along the circular space between the notches, as shewn in fig. 8, the curtain still covering the web of the key; and when the key has been turned sufficiently round, the two stumps *d, e*, drop into the last notches 1, 1, and then the key-hole of the curtain, coinciding with the key-hole of the upper plate, the key may be drawn out with ease.

Should any attempt be made to open this lock with a false key, the first and insurmountable difficulty will be that of constructing a key to such a nicety, that it will elevate the three tumblers to the exact height which is necessary to disengage them from their notches; for if they be not lifted high enough, it is impossible to remove the bolt; and if either of them be lifted a hair breadth too high, then the studs *d, e*, will enter the upper notches of the racks, in which case the bolt will be as immovably fixed as when the stumps were confined in the lower row of notches before described.

"Again: suppose an attempt is made to make or take an impression of any of the parts on a blank key, that will be rendered abortive, for there are no wards, and consequently no impression of them can be obtained; and any impression from the tumblers would be useless, because when the bolt is either in the locked or unlocked position, the tumblers are quiescent, and differently posited in regard to each other, to what they are when raised to their exact height by the proper key.

"The only method that seems left for the depredator to pursue, is that of raising the three tumblers by three separate picks, and then the bolts must be moved with all the works combined with it by a fourth. But whoever examines the lock carefully, and reflects upon its construction, will immediately see that this is impossible; for the very instant the bolt begins to move, that instant the curtain begins to move towards the key-hole, which makes it absolutely impossible to keep the picks or any number of instruments in the key-hole during the motion of the bolt, on account of the parts being so completely united, and also in the simultaneous nature of their action; therefore if the picks are removed the bolt is stationary, and if you apply any number the curtain cannot be advanced, without which the bolt must remain the same, if it were even admitted to be possible to raise the tumblers to the exact height requisite, which I maintain cannot be done.

"This peculiar advantage of leaving no room for picks or other instruments, is effected by means of the particular shape of the key-pin; for by making the upper portion smaller than the lower one, a very small hole is required in the stem of the key at that part, and therefore thickness is gained to make a groove in the stem to permit a part of the curtain to move in, and thereby reduce the space that would otherwise be available to a depredator.

"I trust if the construction of the key be examined at fig. 3, plate 1, it will be sufficiently obvious that no duplicate of the key can be made by taking an impression without the parts being afterwards fitted to the lock, which of course must then be in in possession of the workman."

Mr. Lawton has also applied the principle of his lock, in a very ingenious manner, to that useful appendage of street doors, the spring lock; but a notice of this improvement we must reserve for a future occasion.

THE UNDULATING RAILWAY.

Sir,—I have been casually informed that there is exhibiting somewhere about town a model of an undulating railway, whereby the inventor undertakes to convince the public that the antique notion of level surfaces being the best adapted for wheel-carriages, is entirely wrong; and, of course, if his position be correct, the road surveyors have wasted a "pretty considerable" quantity of money to make roads worse than they were before, by levelling the hills, which ought to be restored without delay. But the inventor of the undulating railway is by no means an originator. The Russian ice-hills on the Neva, for the amusement of the sleighers in the winter season, formed of boarded scaffolds, overlaid with blocks of ice, are much more ancient; and the *Montagnes Russes* of the *Champs Elysées*, which served for summer amusement to the youths and maidens of Paris, the King of Prussia inclusive, some fifteen years back, were railroads of something the same nature as that now proposed. But the proposer of the present undulating railway has stumbled upon a fallacy, which possibly may deceive himself, but which ought not to be suffered to deceive the "barren spectators" amongst the public, because all such fallacies serve to inflict mischief upon the really useful inventors, by getting them classed under the invidious name of "schemers," which ought properly to be confined to the plotters of absurdities alone.

There can be no doubt that a carriage placed on the top of a hill of sufficient

inclination, will descend with so much momentum as to drive it partly up a second hill of the same height and inclination, or over a hill of considerably less height and inclination. There can be no doubt also, that a fly-wheel, put in motion, will continue to revolve for some time after the original moving power ceases to act on it; but it is a woeful error to suppose that either the fly-wheel or the carriage can generate additional power of their own. I once heard a story of an Irish schemer who had devised a plan for increasing the power of a ten-horse engine to that of a fifty, by means of an enormous fly-wheel. Finding a "flat," he was set to work; and when he had, after some difficulty, succeeded in casting his enormous wheel, he expended much money in fitting up an apparatus to turn and polish it all over, to prevent the loss of power by friction in the atmosphere with a rough urface! Much time being lost, the proprietor, who was at all the expense, became impatient, and then there was another delay to know how the wheel was to be stopped, with all its giant power. This having been arranged, both schemer and proprietor were much astonished to find that it would not go at all. The proposition to get additional power, or save power, by means of an undulating surface, savours much of a perpetual motion scheme. It is clear that what is called *momentum* in falling bodies, can be nothing more than *gravitation*, whereby all bodies have a tendency to get as near as they can to the centre of the earth, and the heaviest have the most success. The momentum of the carriage in going down the hill is in proportion to the height which it is raised, and the diminishing of friction by the degree of inclination. In the Russian ice-hills, the first, from which the sleigh starts, is of a given height; the second diminishes; the third also, and so on till the level ice is attained. Were all the hills of the same height, the sleigh would descend the first, partly ascend the second, and then oscillate for a time between both, until it stopped. The reason that the sleigh moves at all, that it possesses the power of motion, is, that it is removed from a lower to a higher level, and the tendency of its gravitating power is to reach the lowest, as is the case with water which has the advantage of being a more mobile substance. But what places the sleigh in the situation to use this power—or, rather, what confers the power upon it? The animal power, either of human hands or horses' shoulders, which has been communicated to it, and which, doubtless, if means were taken to ascertain it, would be found to be exactly equivalent to the power put forth in surmounting the hills, with the exception of the loss by friction, i. e. the animal power applied in the first instance would have served to draw the sleigh on level ground as great a distance, I mean over as many yards of surface, as it traversed on the hills. Therefore, in this case, there would be no *gain* of power, or of any thing but amusement.

The late Mr. Bentham was accustomed to say, in a jocular manner, that when he made a world it should be all down hill. Now, such a contrivance would be admirable for diminishing friction, if there were any arrangement whereby we might always be at the top. If the new invented railway were contrived so that it might be constantly down hill, or over diminishing hills, there is no doubt that much friction might be avoided; but by what process are we to get to the top to begin again? There is but one answer. By labour—got out of animals or steam And what would be the increase of work up hill? What was gained one way would be lost the other. I say nothing of the mischief resulting both to cattle and engines by the irregular motion. But we will suppose the railway an average level, i. e. the undulations to be all alike, what possible advantages can it have over a straight and level surface? It has been shown, that to get the momentum of the high level, the power must be, so to speak, "put into it," i. e. it must be applied beforehand, just as the steam of an engine is got "up" to start with effect, or as is said of a horse who has been off work a few days, "his go is bottled up." When the carriage on the undulating railway has reached as far up the second ascent as the momentum will drive it, how much power must be put on to carry it up the remainder of the ascent? Probably as much as it would have taken to perform the distance of two undulations on a level road. The *Montagnes Russes* of Paris were formed in a circle, and consisted of one descent and one ascent. The descent was steeper than the ascent, yet the impetus or momentum only served to carry

he car one-third up the ascent, when it was hooked by an endless band, worked by horse-power below, and drawn to the top. Now, the power applied by the horses in drawing that car to the top, was probably equivalent to the power which would have been exerted in drawing the car the whole distance on level ground, difference of friction excepted. The fact is, that in all cases the same quantity of power must be consumed to drag a wheel-carriage up to a given height. If the ascent be steep, a large amount of power is requisite for a short time. If the ascent be gradual, a small amount of power will be requisite for a longer time. The total will be equal. Increase of speed is loss of power, and *vice versa;* yet, strange to say, there are numerous unthinking people who believe that, by making a simple machine complicated, as in the case of this railroad, they actually multiply their power; as if an accelerated motion down hill were not balanced by an up hill to ascend in turn.

The process is somewhat similar to that of a man who, determining to erect a watermill, were first to erect a windmill or steam-engine to pump up the water to he height necessary for his water-wheel. There are, I believe, watermills in some f the mining districts which are supplied from the pumps worked by engines, but then the power of the engines is not expended for the purpose of getting a stream of water, but for the purpose of getting rid of a stream of water. The power got out of the water afterwards, was first put into it by the engines, and the saving that power by using it for the watermill is analogous to the process of the soap-makers, who boil down their waste ley to recover the alkali it may contain; but they do not make waste ley for the purpose of getting the alkali out of it. The power of the watermill is commonly but a very small proportion of that of the engines which supply it, because the descent of the fluid is much less than its ascent. Were it to fall on the wheel from a height equal to that from which it was pumped up, the power of the engine and the power of the water-wheel would be nearly equal, the friction of the pump being taken into account.

Whatever the proprietor of the undulating railway may think, "power" cannot be self-generated. A man who is in a valley cannot get up into a mountain without labour of some kind; and whether the ascent to the mountain be a straight inclined plain, or a number of undulations, will matter very little; but what difference of labour there is, will be in favour of the former. When the boy makes his marble bound on the stone pavement, there is no saving of labour to him, because it happens to bound three times with one exertion of his muscles. He is obliged to exert so much the more power. The proposition to gain power by making a carriage go up hill and down hill instead of on a level, reminds me of a scheme I once saw of a self-moving carriage, which was to go on as soon as it was loaded; and the greater the load the faster it was to travel. The ingenious inventor had heard talk of a wheel within a wheel, and he literally put it in practice, small wheels being contrived to run on a rail within the periphery of large ones, both before and behind a four-wheeled vehicle, and so fixed, by means of guides, that the weight was pressing on the rim of the large wheels, at a considerable height above the ground, in the expectation of making them revolve. The inventor had entirely forgotten, that while the large wheel was pressed down hill, the small one had to travel uphill, and consequently that it was "no go." Perfectly similar is the undulating railway. If the eight-wheeled vehicle could have moved at all, it might have been running even unto this day; and if up-hill and down-hill *versus* level, were a clear gain, it might be improved on till animal and machine power might be dispensed with, and the railway locomotive power of every man might reside in his own fingers. We have not come to that yet. We may exert a great quantity of power in various ways it is true, but no more power can come out of a thing than that we put into it. If we wind up a jack, or a clock, or a watch, the amount of power which we have rapidly given, is slowly expended —that is the whole process; but a man would be laughed at who were to assert, that the power we had given to the machines increased in quantity while in their progression; and thus should the man be laughed at who asserts that the power of a horse or machine is multiplied by going up and down hill.

Since writing the above, I have caused

inquiries to be made at the place of exhibition, and am informed that the inventor has gone to Birmingham (I think) for the purpose of setting his scheme going on an undulating railway of three miles in length, to try it on a large scale. So much capital lost to John Bull and his heirs for ever, if the report be correct!

I remain, Sir, yours, &c.

JUNIUS REDIVIVUS.

March 19th, 1833.

[In consequence of a very elaborate paper which appeared two weeks ago on this undulating railway in the *Athenæum*—professing to place beyond all doubt, not only that a great advantage had been actually gained by it, but the "physical principle" on which it depends—we went to the place where it was said to be exhibited, in order that we might see the prodigy with our own eyes. We were informed, however, that the inventors had left town on the very hopeful mission alluded to at the close of the preceding communication—(how curious that, after all, a *flat*—a *flat* should be the thing!) and so for the present were obliged to rest content with the statements furnished by our contemporary. Some remarks on these statements we were on the point of committing to paper, when we received the very acute and sensible letter on the subject, which we now insert, from our friend, "Junius Redivivus," and which appears to us to make all further observation superfluous.—ED. M. M.]

INSTRUMENTS FOR DRAWING SPIRALS.

Sir,—I beg leave to notice a singular mistake of your correspondent whose instrument for drawing spirals appeared a weeks ago in your Magazine. He states, that by his instrument ellipses may be described, whose diameter shall be in any given proportion to each other, and that the same thing cannot be effected by instruments whose action depends upon wheelwork. Each branch of this assertion is incorrect. We may conceive the difference between the longest and shortest diameters of an ellipsis to be infinitely small; in this case it differs insensibly from a circle, or it may be infinitely great, in which case it differs insensibly from a right line. Now, by an instrument invented by Mr. Child for drawing spirals, and also by another invented by myself, both of which are described in the Mech. Mag., and both of which are actuated by wheel-work, a circle, a right line, or a point, (which latter may be considered as a circle whose diameter is infinitely small), may be described by the revolution of the instrument; but as your correspondent's instrument turns upon a pivot set in the paper, upon which the figure is to be traced, the tracing point can never coincide with the centre of revolution, consequently, cannot describe a right line, nor indeed any figure whose least diameter is less than the least distance at which the tracer can be set from the centre.

Your most obedient servant,

J. MURDOCH.

March 25, 1833.

MR. OGLE'S STEAM CARRIAGE.

Sir.—Mr. Ogle asserts (p. 406.) that "the vehicle now at the Bazaar, in King Street, with from sixteen to twenty persons in it, and much luggage, went from Knutsford to Hoo Green, three miles and a half, in five minutes," and he refers to Mr. Bischoff, and several other persons for corroborative testimony of the fact. Now, Sir, I think that in a case of this marvellous description, the public are entitled to require that the very best evidence of which it admits shall be produced. Mr. Ogle, of course, is not so good a witness as Mr. Bischoff, or any of the other persons present; for Mr. Ogle is an interested person in the affair, and besides, he does not say that he himself timed, the vehicle. I must therefore be excused for saying, that until Mr. Bischoff and the other persons who were present and did time the vehicle, shall come forward and vouch for the correctness of Mr. Ogle's statement, I shall remain one of those who think with you, that it is founded on some mistake.

Another thing I should like to see explained. Was the road gone over at such speed an ordinary gravel road or a stone causeway? I once travelled to Liverpool by the way of Knutsford, and I recollect well passing for a mile or two in that neighbourhood (it might have been "three and a half") over a causeway of a very excellent description. What then if it should turn out that it was on this

causeway the speed in question was accomplished! The wonder would of course be diminished amazingly.

I beg before concluding to say, that, in common with several of your readers of my acquaintance, who feel much obliged to you for the honest and impartial part you have taken on this subject, I felt not a little disappointed that you should have suffered Mr. Ogle's angry epistle to pass without remark. It is surely not so triumphant an affair.

I am, Sir,
Your obedient servant,
SPOKE.

Pall Mall, 25th March, 1833.

[We published Mr. Ogle's letter without remark, simply because we thought all remark surperfluous.—We made him a present, as the Irish members say, of his explanation. Ed. M. M.]

THE LATE MR. TREDGOLD.

We regret extremely to learn from a circular letter, signed by a number of the most eminent members of the Institution of Civil Engineers, that the family of the late learned, ingenious, and very amiable Mr. Thomas Tredgold, have been left in so destitute a condition, that it has been found necessary to set on foot a subscription, to procure them "the necessaries, not to say the comforts of life." The circular, in speaking of Mr. Tredgold's numerous scientific works, observes of them with great truth, that "they abound in the most correct calculations and valuable tables—experiments made with great ingenuity and care—able and judicious general observations, the result of the most profound and solid mathematical knowledge, the most extensive reading, and the closest and most acute reasoning." Mr. Tredgold may have had his superiors in mathematical erudition, but we know of few writers during the last twenty years who have conferred greater benefits on practical science. When the hand of Death fell upon him he was but just on the point of reaping the full benefit of the distinguished reputation which his works had obtained for him; and all he had to bequeath to his family was the memory of a singularly useful, virtuous, and honourable life. His widow followed him shortly after to the grave; and the individuals on whose behalf the present appeal is made are four orphan children (the eldest under thirteen years of age), and an aged and infirm grandmother. We cannot permit ourselves to suppose that it will be otherwise than eminently successful. Every person connected with mechanics—from the civil engineer down to the humblest carpenter—will but discharge a debt of gratitude for services rendered in contributing according to his means. Subscriptions will be received by any of the following gentlemen:—Mr. Deville, of the Strand; Mr. Taylor, of the Architectural Library, High Holborn; Mr. Edward Bury, Liverpool; or Mr. Gibbon, Secretary of the Institution of Civil Engineers.

NAUTICAL INSTRUMENTS.

Sir,—I wish some of your numerous nautical readers would state whether there is any instrument in existence for ascertaining the distance between a ship at sea and an object of unknown proportions? I am aware of the principle of the micrometer, and have seen one attached to a telescope, but that requires the proportions of the object looked at *to be known*, so as to calculate by the breadth of a brick in a wall the height of a man, &c.; but I think I have lately heard that the thing I mean has been done by a Frenchman, and before I waste time and money in experimenting, I would be extremely obliged if you would give your correspondents an opportunity of pointing out whether such an instrument exists.

I have the honour to remain, Sir,
Your obedient servant,
MERCATOR.

London, March 20, 1833.

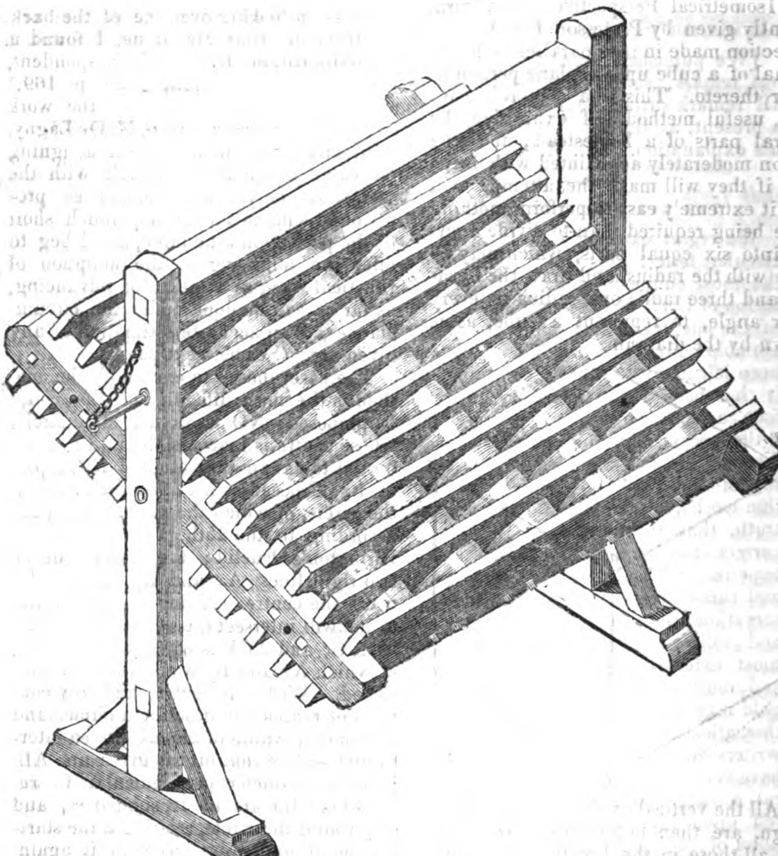
ISOMETRICAL PERSPECTIVE.

Sir,—In 1825, Dr. Olinthus Gregory, in his "Mathematics for Practical Men," transcribed an interesting paper of Professor Farish's on "Isometrical Perspective," which he considered "peculiarly deserving the attention of mechanics and engineers." Shortly afterwards I made use of this perspective in a work on "Designs for Agricultural Buildings," by my late uncle, Mr. Charles Waistell. Besides giving representations of the buildings, I showed in this way, in a small wood engraving, the method of connecting a tie beam with a wall-plate. This applica-

tion of isometrical perspective, in which every dimension was correctly given to the same scale, was explained at the time to an eminent architect, who said "it was worth the price of the book."

I have not seen all Mr. Loudon's "Encyclopædia of Cottage, Farm, and Villa Architecture," but I have noticed in some of his Numbers, that he has also applied this perspective to the representation of agricultural buildings. I frequently use this projection; but with the above exceptions, I do not recollect to have seen it applied by others; and I have often been surprised that it has not long ago become generally known, and as generally used in your pages.

In order to obtain the particular attention of your correspondents to this subject, I send herewith a projection of the "Swing frame for cheeses," which I find in your last number; and I trust the very great advantage of "Isometrical Perspective," will, on comparison, be sufficiently apparent.



With the assistance of a parallel ruler, and a triangle, with angles of 30, 60, and 90°, I find the direction which any right line should have is either directly produced, or may, by these means, be obtained. It is quite as easy to make this projection, as to draw the two elevations you have already given.

Sometimes an outline will be found to give a sufficient representation of an object; but generally it will be more distinct if the surfaces in differently inclined

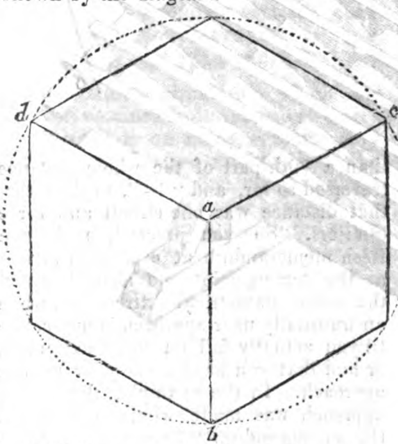
planes, are shaded with a different tint. Shadowing, I think, will seldom, if ever be found requisite.

I am, Sir,
Your obedient servant,
JOSEPH JOPLING.

33, Sloane Street.

We take leave to add our earnest recommendation of this manner of drawing to the attention of our readers. It has for all *working* purposes a decided advantage over every other. In Mr. Jopling's edition of his uncle Mr. Waistell's book, it is thus briefly but intelligibly described.

"Isometrical Perspective," is a term recently given by Professor Farish, to a projection made in rays parallel to the diagonal of a cube upon a plane perpendicular thereto. This is a comprehensive and useful method of exhibiting the several parts of a homestead; and any person moderately acquainted with drawing, if they will make the attempt, will find it extremely easy to perform, nothing more being required than to divide a circle into six equal parts, which may be done with the radius, and draw the hexagon and three radii, one radius to every other angle, to represent a cube, as is shown by the diagram.

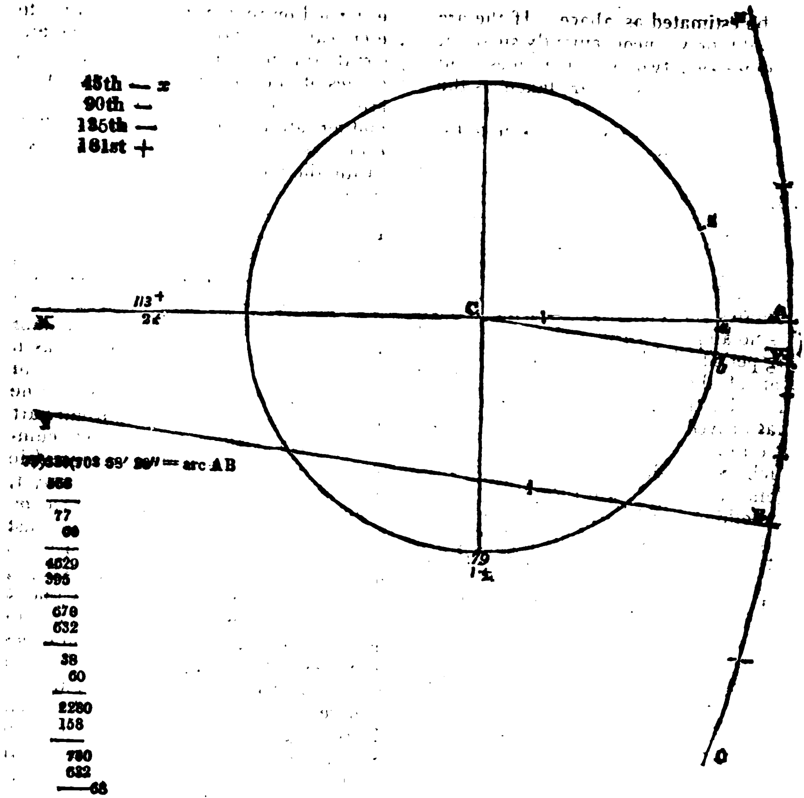


"All the vertical or plumb lines in any design, are then to be drawn parallel to *a b;* all those in the direction, say north and south, parallel to *a c;* and all those at right angles, or perpendicular to the last, or in the direction east and west, parallel to *a d;* and the several heights, lengths, and breadths, being taken from a scale of equal parts, and set off, and lines drawn in these three directions, the projection is produced. The position of any point, or the direction of any other line, may be found, by finding where the first would fall on any plane parallel to either of the three sides of the cube, and where the latter, if produced, would cross any lines in the three directions."

GRADUATION. — METHOD OF MEASURING AN ARC OF A CIRCLE WHOSE CENTRE IS INACCESSIBLE BY MEANS OF THE COMPASSES ALONE.

Sir,—In looking over one of the back volumes of your Magazine, I found a communication from a correspondent, "O. C. F." (25th April, 1829, p. 169,) conveying, as an extract from the work of a French mathematician, M. De Lagny, a description of a method of assigning the value of an arc of a circle with the compasses only. The method so prescribed seems to me to stop much short of the perfection attainable, and I beg to offer the following to the adoption of practical men, as a means of advancing, as far as can be done under the circumstances, to an accurate estimation of any given arc. (See fig. next page.)

The case chosen to exemplify the method is the most difficult one that could be proposed: NO is an arc of a circle, whose centre is inaccessible, and it is required to assign the value of AB, a part of it. Proceed as if to find the centre of the circle, of which the given arc is part, according to the 25th prop. 3d book of Elrington's Euclid; the result will be two right lines, Ax and By, tending toward the centre. A line drawn parallel to one will intersect the other some where, as at C, and ACV is equal to the angle, at which Ax and By would meet, if produced. With *c* as centre, and any convenient radius, *ca*, describe a circle, and the angular value of the arc *ab* so interrupted will be that of the given arc AB. Draw a diameter perpendicular to *xa*. Now take the arc *ab* in compasses, and step round the circle, making *a* the starting point until you arrive at it again. If the compasses at the last step of the circuit fall exactly on the starting point, the arc is an aliquot part of the circle, and is ascertained; if not, make a memorandum of the number of steps made, adding + or — according as the last



step falls short of, or overpasses, the starting point; and then, without having raised the compasses, go round again. By the way, observe how nearly the step approaches any of the other diametrical extremities in passing, and if it fall very near, mark the point it falls on, and add a memorandum of the progress made to that place, and of the number of steps laid down. Thus, in the example, the first circuit took 45 steps, and the 45th step fell a little short of the starting point; the memorandum accordingly was "45th—x," indicating that the arc stepped was somewhat less than a 45th part of the whole.

At the close of the third quarter of the second circuit, the step fell very nearly on one of the diametrical extremities: the point of its fall was marked, and a memorandum added "79—", to show that the arc stepped was somewhat less than a 79th part of the whole distance traversed so far, and "1¾", to show that that distance was one circuit and three quarters. So you proceed, making a fresh memorandum at every new arrival at the starting point, and also at any of the other diametrical extremities, when an unusually near approach is made, until you actually fall on some extremity, or find that you have made your nearest approach. In the example, the nearest approach was made where was placed the memorandum "79 — and 1¾"; one circuit and ¾, or (360°+270°) is therefore the dividend, 79 the divisor; the quotient is the value of the arc, too little by an error equal to the 79th part of the interval left between the end of the 79th step and the diametrical extremity. If the value of the whole arc NO were required, it should be first divided into four parts by two bisections, and one of the fourth

could be estimated as above. If the arc *ab* should prove inconveniently small, it may be stepped two or three times, and the sum of the steps, as *ac*, taken as the working step.

The advantages of this plan seem to be, chiefly, the very minute subdivision of the error, carried on even within the limit of a hair's breadth, with common care; and, secondarily, the freedom from the necessity of changing the step of the compasses when once adjusted. The number of diametrical points also facilitates and accelerates the operation. If the given arc is no aliquot part of a circle, a circulating period will be observed in the variation of the errors, and practice will soon enable the operator to discover when he has arrived at or passed the period of least error.

Such, Sir, is the plan; your practical readers will recognise in the principle of it something similar to that of Borda's repeating circle, and I shall be happy to see it improved upon still farther, if it be deemed worthy of the pains.

I am, Sir, your obedient servant,

φ. μ.

MR. BABBAGE'S ECONOMY OF MACHINERY AND MANUFACTURES.

Second and Third Editions.

The extensive circulation which this work has obtained in the course of a very short period, is on many accounts very remarkable. In two months from the publication of the first edition, three thousand copies were in the hands of the public; and in much about the same time, a second edition (the number of copies not stated) has disappeared; making it necessary that a third should be issued from the press. All this too, although the author informs us "very little was spent in advertisements, and the booksellers, instead of aiding, impeded its sale," owing to certain free strictures which the work contains on the "Book Trade." We suspect that not many works have been recently published, which can boast of so rapid and extensive a sale. It seems to have been read with much the same avidity which used to await the appearance of a new novel by Scott, or new poem by Byron. Mr. Babbage ascribes "some small part of this success," to the popular exposition which the book contains "of those curious processes which are carried on in our workshops, and to the endeavour to take a short view of the general principles which direct the manufactories of the country." But "the chief reason" he considers to be "the commanding attraction of the subject, and the increasing desire to become acquainted with the pursuits and interests of that portion of the people which has recently acquired so large an accession of political influence." We must take leave, however, with all due submission to Mr. Babbage, to discard his "chief reason" altogether. We feel convinced that his work would have sold quite as well, had the Reform Act never been heard of. The true reason of its popularity is doubtless to be found in those features of the work to which he modestly ascribes but "some small part of its success;" and in the further circumstance of its being addressed to a people who are, beyond any other in the world, entitled to the appellation of *manufacturing*—who owe the better part of their vast wealth and power to the "curious processes" so well described by the author, and who are arrived at that point that it is only by improving those processes to the utmost degree of which they are susceptible—to which end nothing is more conducive than a perfect understanding of those principles of "Economy," which Mr. Babbage has made it his business to develope—that they can hope to maintain that manufacturing pre-eminence which they have so long enjoyed.

Having expressed at some length, our opinion of the work on its first appearance, we shall, on the present occasion, confine our attention to the additions which have been made to it in the second and third editions.

The most important of these additions are three new chapters, "On Money, as a Medium of Exchange," "On a New System of Manufacturing," and "On the Effect of Machinery in reducing the demand for labour."*

Mr. Babbage invites attention in a particular manner to the "New System of manufacturing." He believes "that some such system of conducting manufactories would greatly increase the productive powers of any country adopting it; and that our own possesses much greater facilities for its application than other coun-

* These chapters have been very properly printed in a separate form, for the use of the purchasers of the first Edition.

tries, in the greater intelligence and superior education of the working classes." As matters are now managed, Mr. Babbage thinks that though it is "perfectly true that workmen, as a class, derive advantage from the prosperity of their employers," yet each individual does not "partake of that advantage exactly in proportion to the extent to which he contributes towards it." The "new mode of manufacturing," by which Mr. B. proposes to rectify this state of things, is unfolded in the following extract:—

"I shall now present the outline of a system which appears to me to be pregnant with the most important results, both to the class of workmen, and to the country at large; and which, if acted upon, would, in my opinion, permanently raise the working classes, and greatly extend the manufacturing system.

The general principles on which the proposed system is founded, are—

1st. *That a considerable part of the wages received by each person employed, should depend on the profits made by the establishment, and,*

2d. *That every person connected with it should derive more advantage from applying any improvement he might discover, to the factory in which he is employed, than he could by any other course.*

It would be difficult to prevail on the large capitalist to enter upon any system, which would change the division of the profits arising from the employment of his capital in setting skill and labour in action; any alteration, therefore, must be expected rather from the small capitalist, or from the higher class of workmen who combine the two characters; and to these latter classes, whose welfare will be first affected, the change is most important. I shall therefore first point out the course to be pursued in making the experiment; and then, taking a particular branch of trade as an illustration, I shall examine the merits and defects of the proposed system as applied to it.

Let us suppose, in some large manufacturing town, ten or twelve of the most intelligent and skilful workmen to unite, whose characters for sobriety and steadiness are good, and are well known among their own class. Such persons will each possess some small portion of capital; and let them join with one or two others who have raised themselves into the class of small master manufacturers, and therefore possess rather a larger portion of capital. Let these persons, after well considering the subject, agree to establish a manufactory of fire irons and fenders and let us suppose that each of the ten workmen can command forty pounds, and each of the small capitalists possesses two hundred pounds: thus they have a capital of 800*l.* with which to commence business; and, for the sake of simplifying, let us further suppose the labour of each of these 12 persons to be worth two pounds a week. One portion of their capital will be expended in procuring the tools necessary for their trade, which we shall take at 400*l.*, and this must be considered as their fixed capital. The remaining 400*l.* must be employed as circulating capital, in purchasing the iron with which their articles are made, in paying the rent of their workshops, and in supporting themselves and their families until some portion of it is replaced by the sale of the goods produced.

Now the first question to be settled is what proportion of the profit should be allowed for the use of capital, and what for skill and labour? It does not seem possible to decide this question by any abstract reasoning: if the capital supplied by each partner is equal, all difficulty will be removed; if otherwise, the proportion must be left to find its level, and will be discovered by experience; and it is probable that it will not fluctuate much. Let us suppose it to be agreed that the capital of 800*l.* shall receive the wages of one workman. At the end of each week every workman is to receive one pound as wages, and one pound is to be divided amongst the owners of the capital. After a few weeks the returns will begin to come in; and they will soon become nearly uniform. Accurate accounts should be kept of every expense and of all the sales; and at the end of each week the profit should be divided. A certain portion should be laid aside as a reserved fund, another portion for repair of the tools, and the remainder being divided into thirteen parts, one of these parts would be divided amongst the capitalists, and one belong to each workman. Thus each man would, in ordinary circumstances, make up his usual wages of two pounds weekly. If the factory went on prosperously, the wages of the men would increase; if the sales fell off, they would be diminished. It is important that every person employed in the establishment, whatever might be the amount paid for his services, whether he act as labourer or porter, as the clerk who keeps the accounts, or as book-keeper employed for a few hours once a week to superintend them, should receive one-half of what his service is worth in fixed salary, the other part varying with the success of the undertaking.

In such a factory, of course, division of labour would be introduced;

some of the workmen would be constantly employed in forging the fire-irons, others in polishing them, others in piercing and forming the fenders. It would be essential that the time occupied in each process, and also its expense, should be well ascertained; information which would soon be obtained very precisely. Now, if a workman should find a mode of shortening any of the processes, he would confer a benefit on the whole party, even if they received but a small part of the resulting profit. For the promotion of such discoveries, it would be desirable that those who make them should either receive some reward, to be determined after a sufficient trial by a committee assembling periodically; or if they be of high importance, that the discoverer should receive one-half or two-thirds of the profit resulting from them during the next year, or some other determinate period, as might be found expedient. As the advantages of such improvements would be clear gain to the factory, it is obvious that such a share might be allowed to the inventor, that it would be for his interest rather to give the benefit of them to his partners, than to dispose of them in any other way.

The result of such arrangements in a factory would be,

1. That every person engaged in it would have a *direct* interest in its prosperity; since the effect of any success, or falling off, would almost immediately produce a corresponding change in his own weekly receipts.

2. Every person concerned in the factory would have an immediate interest in preventing any waste or mismanagement in all the departments.

3. The talents of all connected with it would be strongly directed to its improvement in every department.

4. None but workmen of high character and qualifications could obtain admission into such establishments; because when any additional hands were required, it would be the common interest of all to admit only the most respectable and skilful; and it would be far less easy to impose upon a dozen workmen, than upon the single proprietor of a factory.

5. When any circumstance produced a glut in the market, more skill would be directed to diminishing the cost of production; and a portion of the time of the men might then be occupied in repairing and improving their tools, for which a reserved fund would pay, thus checking present, and at the same time facilitating future production.

6. Another advantage, of no small importance, would be the total removal of all real or imaginary causes for combinations. The workmen and the capitalists would so shade into each other—would so *evidently* have a common interest, and their difficulties and distresses would be mutually so well understood, that, instead of combining to oppress one another, the only combination which could exist would be a most powerful union *between* both parties to overcome their common difficulties."—pp. 17—22.

Mr. Babbage will no doubt be surprised to learn that this new system of manufacturing, though new to him, is by no means new, either in theory or in practice, to the working classes of England. The notion of obtaining a fairer share of the produce of their industry, by means of fellowship arrangements similar to those proposed by the learned professor, has been long familiar to English mechanics,—has been tried by many of them to be reduced to practice, though hitherto with but small success—and is still fondly cherished by numbers. Mr. Babbage's "new mode of manufacturing," is, in fact, only the much talked-of "co-operative" system after a new fashion. It is that system stripped of all its fantastic features, and limited to the mere matter of production. Neither does it propose to do more for the working classes than the working classes have of their own accord been endeavouring to do for themselves, during the last six or seven years, by means of the various associations, known under the name of "Trading Unions." We are not so well acquainted with the history of these associations as we could wish, but we learn from a very sensible pamphlet which we have now before us, by a Mr. John Evelyn of Edgbaston,* near Birmingham, that in the beginning of 1830, there were no less than *two hundred and sixty* of them, comprehending about sixteen thousand members; and that though most of them were associations for the purchase and sale of goods--at prime cost to the members and for the usual profit to the public—yet that they included both Trading *and Manufacturing* Co-operative Societies. We learn further, that chiefly owing to the existing state of the laws respecting partnerships, which exempt the frauds of partners on each other, from every ordinary means

* An Address to the Labouring Classes on the plans to be pursued and the errors to be avoided n conducting Trading Unions. By John Evelyn. outer. 1830.

of redress, many of these unions had proved grievous failures, and that they were all in a fair way, if not speedily placed on a better footing, of sharing a similar fate. Mr. Babbage has adverted to the existence of this legal difficulty, but he suggests that the legislature should take into consideration what changes in the law would be necessary to suit the "new" state of things which he proposes to introduce. We shall not dispute that every needful change in the law might be made, though certainly we do not at present see our way in the matter, but we apprehend that the nature of things also must be changed before the good which Mr. B. anticipates from his system could be realised. The risk of fraud is but one of many risks to which all such associations must necessarily be subject. Mr. Evelyn, who is a warm advocate for "Trading Unions," and seeks only to place them on a secure basis, distinctly admits that it is essential to their prosperity that they should limit thier operations to trading in the most absolute necessaries of life, to such articles as are in universal and constant demand, and but little affected in price by the fluctuations of commerce. *Manufacturing Unions* he repudiates altogether, and for the plain and convincing reasons stated in the following brief extract:

"A steady trade in the necessaries of life, pursued with vigilance and perseverance, will eventually secure a greater profit than any other that could be depended upon; and there is this very serious objection to attempting any other, that success in the outset will be very likely to create an anxiety to pursue that branch of business to a degree which will certainly lead to failure and loss. When a new market is formed for our produce, the early profits of the merchants lead to increased exports, till the country is overstocked, and distress and bankruptcy are the inevitable consequences. So would it be with you. The profits of your early speculations would encourage you to pursue that branch of trade till profits were gone and you were left with an unsaleable stock."

Mr. Babbage proposes, it is true, to provide against the consequences of such a "glut" by "a reserved fund;" but that would only be to get rid of one evil by substituting a worse. If the funding principle were once acted upon in such unions, the consequence would be that the spirit of saving would soon destroy altogether the spirit of speculation, which in itself is a most salutary spirit, and in its excess only injurious. The hoarding tendency, so common to all associated bodies of men whose minds are not of an exalted order, is well exemplified in the following passage of Mr. Evelyn's Address.—

"Allan Cunningham, in his interesting *Life of West*, when speaking of the growing funds of the Royal Academy says, "how to lay out the money became the signal for vehement debate. The architects were for a house, the sculptors for statues, and the painters proposed a large gallery for historical works; while a mean or sordid member or two voted to let it be and grow more, *for it was pleasant to see riches accumulate.* Thus it appears to be with a considerable number of the members of the Trading Unions, but with this difference, that the minority are for spending each according to his particular taste, while the majority eagerly desire to see their "riches accumulate," and from the "sordid" motives so emphatically stated by this author. * * I appeal to the accounts which appear almost every week in the co-operative journals from the various societies in the different parts of the kingdom, and I ask whether they do not in almost every instance contain boasting records of how much money has been *saved* or *gained* rather than the statements of substantial benefits conferred upon the members."

Another inevitable consequence of the funding or accumulating principle would be, that each manufacturing union would become after a time a little body of capitalists, as much raised above the general body of workmen, and actuated by as different interests and motives, as individual capitalists are now supposed to be.

Mr. Babbage refers to the Cornwall practice of gangs of miners working by contract, to the payment of the crews of whaling ships according to the number of fish caught, to the division of profits between the owners of fishing nets and those who use them on the south coast of England, as all so many successful approximations to the new system he wishes to introduce. But he overlooks this material fact, that in all these cases there is no permanent or accumulating fund, no capital vested by the labourers themselves, and no bond of union of any longer duration than the job immediately in hand. They answer well, precisely because they stop short of those practical difficulties which forbid us to hope that

any good can ever come of Mr. Babbage's plan.

In the new chapter "on Money as a Medium of Exchange," Mr. Babbage proposes to approximate to the facility of the decimal system, in a manner nearly similar to that suggested some time ago in this journal by Mr. Jackson.

"The great step, that of abolishing the guinea, has already been taken without any inconvenience, and but little is now required to render the change complete. If whenever it becomes necessary to call in the halfcrowns, a new coin of the value of two shillings were issued, which should be called by some name implying a unit, (a Prince, for instance) we should have the tenth part of a sovereign. A few years after, when the public were familiar with this coin, it might be divided into one hundred, instead of ninety-six farthings, and it would then consist of twenty-five pence, each of which would be four per cent less in value than the former penny. The shillings and sixpences being then withdrawn from circulation, their place might be supplied with silver coins, each worth five of the new pence, and by others of ten pence and of two pence halfpenny; the latter coin having a distinct name, would be the tenth part of a Prince."—p. 25.

The obvious objection to every scheme of this kind is, that it must, to a certain extent, be of a confiscatory nature. The abolition of the guinea piece did not cause twenty-one shillings to go for less or more than they did before; neither would Mr. Babbage's two-shilling prince alter the value of the shilling in the least; but the moment it was settled by the farther alterations which Mr. B. proposes, that a shilling should pass for twelvepence and a halfpenny, from that moment every person who had a debt, rent-charge, or annuity to receive, which had been adjusted according to the old coinage, would be defrauded to the extent of four pounds in every one hundred pounds. The question then comes to this—Would the increased facility which the decimal system would impart to the transactions of commerce, compensate for the injury attending its introduction, in the way Mr. B. suggests? We are of opinion that it would not.

The chapter on "The Effect of Machinery in reducing the Demand for Labour" does not contain any new facts or new views, but is conceived in a very just and candid spirit. Mr. B. observes, very truly, that "the data necessary for a full examination of this important subject" have "unfortunately not yet been collected." Individuals are still wanting to do that for other branches of manufacture which Mr. Felkin has done for the bobbinnet trade. — (See *Mech. Mag.* for Oct. 15, 1831.)

The lesser additions made to the work, since the first edition, are very numerous, and among them are some of a very curious and valuable character. We think the following particularly deserving of attention from the Government and the public:—

"Clocks occupy a very high place amongst instruments, by means of which human time is economised; and their multiplication in conspicuous places in large towns, is attended with many advantages. Their position, nevertheless, in London, is often very ill chosen; and the usual place, half way up on a high steeple in the midst of narrow streets in a crowded city, is very unfavourable, unless the church happen to stand out from the houses which form the street. The most eligible situation for a clock, is that it should project considerably into the street at some elevation, with a dial-plate on each side, like that which belonged to the old church of St. Dunstan in Fleet Street, so that passengers in both directions would have their attention directed to the hour. A similar remark applies with much greater force to the present defective mode of informing the public of the position of the receiving houses for the twopenny and general-post. In the lowest corner of the window of some attractive shop, is found a small slit, with a brass plate, indicating its important office, so obscure, that it seems to be an object rather to prevent its being conspicuous. No striking sign assists the anxious inquirer, who, as the moments rapidly pass which precede the hour of closing, torments the passenger with his inquiries for the nearest post-office. He reaches it, perhaps just as it is closed, and must then either hasten to a distant part of the town, in order to procure the admission of his letters, or give up the idea of forwarding them by that post, and thus, if they are foreign letters, he may lose perhaps a week or a fortnight by waiting for the next packet. The inconvenience in this, and in some other cases, is of perpetual and every day occurrence; and though in the greater part of the individual cases, it may be of trifling moment, the sum of all these produces an amount which

it is always worthy of the government of a large and active population to attend to. The remedy is simple and obvious; it would only be necessary at each letter-box to have a light frame of iron projecting from the house, over the pavement, and carrying the letters G. P., or T. P, or any other more diminutive sign. All private signs are at present very properly prohibited from projecting into the streets; the passenger therefore would at once know where to direct his attention in order to discover a post office; and those letter-boxes which occurred in the great thorough-fares could not fail to be generally known.—p. 45.

It is scarcely necessary to add, that we think the work has, upon the whole, been much improved, as well as "enlarged." We are very glad to see that Mr. Babbage keeps his mind applied to the important subjects of which it treats, and has not fallen into the error so common to successful authors, of taking "well enough" for "as good as may be." We are still of the opinion which we first expressed, that Mr. Babbage has yet a great deal to learn respecting the practices of our manufactories, before he can do full justice to the questions of "Economy" involved in them; but we feel disposed to hope every thing from a gentleman who exhibits so anxious a desire for information, and so much openness to conviction, in union with habits of generalisation and deduction of the very highest order.

RECENT AMERICAN PATENTS.

(From the Franklin Journal.)

MACHINE FOR CUTTING AND HEADING NAILS. *Emeruld Mason.*—"In this machine, a nail plate of any length is to be entered between rollers, and by these it is carried forward to the cutters, without being either turned or vibrated, as is usually done, for the purpose of cutting one nail out of the other. A revolving cylinder, in front of these rollers, carries two movable cutters placed on opposite sides of it: these stand out from the cylinder to a distance equal to that of the width of the nail, the angles which their cutting edges form with it being in directions the reverse of each other. The bed cutter, which in nail machines in general is stationary, is made to vibrate upon a pin passing through the centre of its face, and thus to adapt itself to the reversed directions of the revolving cutters. The nails, as they are cut, drop into the spaces between the projections on a kind of cog wheel prepared to receive them, and they are there griped in a way calculated to hold them firmly, and are headed by apparatus operating on either face of the wheel, the heading dies being forced up by toggle joints. The claim is to 'the application of a revolving circular cutter to the cutting of nails, and that so arranged as to cut them without turning the plate; the application of the feeding rollers; the receiving and holding the nail, after being cut, between the cogs of wheels; the application of the leve power, as described, to the heading of the same when so held, and the unparalleled speed with which they are made.'—With the exception of the latter, the form in which the claims are made appears to be good, the only question being upon their originality. We do not know whether any one has heretofore succeeded in cutting nails by revolving cutters, but we saw it tried more than twenty years ago. The machinery, however, was not well made, and was much too weak to accomplish its object. An unsuccessful trial, however, is not to militate against one that is successful—neither justice or law admit of this. Should the machine of the present patentee answer as well as he anticipates, it will be one of great value, but still its 'unparalleled speed' will be no more the subject of a patent than was the unparalleled speed of Childers or Eclipse. The patentee says, 'It is also *expected* that nails of ordinary sizes may be made at the rate of three hundred to seven hundred per minute.'"

STEAM ENGINE FOR RAISING WATER. *David Colver.*—"Were Captain Savary alive, but, alas! he has been dead more than a century, he would smile to see how much the steam engine had degenerated in modern times. He, it is true, invented one for raising water, acting upon the same principle with that now presented to us, but very far superior to it, yet his was superseded by Newcomen's atmospheric engine, and Savary joined in the concern, abandoning his own machine, and little dreaming that its ghost would appear upon the earth after a lapse of ages."

SECRETS IN POTTERY.

Sir,—Some of your correspondents having inquired concerning Pottery Glazes, will you submit these *few* recipes of *bodies and glazes* to their consideration. I have reason to believe that they include nearly all of those in any repute.

Yours, &c.,
FRIAR BACON.

Hulton Abbey, Burslem, February 29, 1833.

Cream-Colour Bodies—Slip State.

Nos.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Blue Clay	37	50	60	75	66	57	56	50	68	67	49	75	82	—	—
Black ditto	18	26	—	—	—	—	—	23	—	—	24	—	—	87½	90
China ditto	28	—	18	—	17	23	18	7	14	14	9	—	—	—	—
Flint	14	24	20	23	17	16	18	19	18	17	17	25	18	12½	10
Cornwall Stone	3	—	2	2	—	4	8	1	—	2	1	—	—	—	—
Parts	100	—	—	—	—	—	—	—	—	—	—	—	—	—	—

No 1. is a good body, much approved in the American Market; requires a hard fire. 2 is good for enamelling. 5 is R. Stevenson's body for the Continent; and is good for printing (for glaze for it see Glazes, No. 13). 6, Rivers and Clowes's, and much approved. The proportions of ball clay, are 20 blue, 5 black, 2½ brown; for 7, 3½ blue, 1 china, 1 flint, ½ stone; for 8, 15 blue, 5 black, 1 cracking clay; 14 is for King and Stilt's, through 6 lawn sieve; 15 for Pegs.

Weight per Ale Pint, and Contents.

	oz.	drs.	oz.	
Clay lip	26	5	6 of Dry Cl	.
China Clay	26	5		
Flint and Stone	32	12	22	Flint.

120 pecks of Flint Slip (32lbs. peck) are obtained from 1 ton of Raw Flint

E. Wood's Cream-Coloured Bodies.

Nos.	1	2	3	4	5	6	7	8
New Clay	88	75	84	80	60	66	—	—
Common do.	—	—	—	—	—	—	50	75
China do.	—	—	—	—	20	16	17	10
Flint	2	10	10	10	15	15	17	10
Cornwall Stone	10	15	6	10	5	3	16	5
Parts	100	—	—	—	—	—	—	—

The Clay Slip and Stone, 24 oz. to pint; Flint, 30 oz.

Rodgers's Cream-Coloured Bodies.

Nos.	1	2	3	4	5	6	7	8	9
Black Clay	36	40	30	34	35	35	30	25	24
Brown do.	25	20	20	16	15	20	16	12	—
Blue do.	25	25	15	20	15	10	10	25	48
China do.	—	—	15	10	15	20	26	20	—
Flint	10	10	15	12	12	13	15	14	24
Cornwall Stone	4	5	5	8	8	4	3	4	4
Parts	100	—	—	—	—	—	—	—	—

These serve also for Printing; and No. 9, run through a 12 lawn twice, is very good for printed Tea Ware. The weight per pint is, Clay, 24 oz.; Stone, 21 oz.; Flint, 30 oz.

Cream-Colour Glazes.

Nos.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Glass	80	..	..	..	..	..	..	4	5	..	..	5	16	17	8	80	38	10	..	..
W. Lead	—	64	60	66	72	55	66	53	57	69	66	66	47	50	75	Red 10	4	30	71	86
Cornwall Stone	—	24	32	4	..	45	16	16	28	23	22	11	31	25	..	—	*3	28	9	5
China Clay	20	..	..	10	..	..	2	..	..	..	..	..	..	..	..	10	..	..	..	..
Dry Flint	..	12	8	20	28	..	16	27	10	8	12	18	6	8	17	....	49	9	20	9
Borax	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	....	6	23	..	..
Parts	100	..	..	..	..	..	..	..	..	..	..	..	..	..	..	....	..	..	..	..

Nos.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Glass	..	5	..	..	..	..	..	..	6	..	4	5	5	..	..	..	..	..	..	..
W. Lead	70	55	70	65	62	62	60	60	56	63	58	60	70	70	65	60	63	56	50	54
Cornwall Stone	20	30	25	25	20	21	30	35	28	27	20	25	10	8	28	10	18	23	32	25
Dry Flint	10	10	5	10	18	10	10	5	10	10	18	10	15	28	7	30	18	20	16	20
Borax	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	2	1
Parts	100	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

No. 2 is Wedgwood's; 7 is for Brown Ware; 8 and 11, Wilson's; 10, Toft's; 13, Stevenson's 27, Rivers'; 37, Spode's; 14, Mr. St. Amand's. Most of them are excellent on particular Bodies. Mean of the five best:—W. Lead, 65; Stone, 24; Flint, 11.

Blue Printing Bodies.—Slip State.

Nos.	1	2	3	4	5	6	7	8	9	10	11	12	13
Blue Clay	35	60	35	40	27	56	60	55	57	50	50	66	40
Black do.	15	—	10	15	11	—	—	—	—	10	20	—	10
Brown do.	15	—	15	10	12	—	—	—	—	—	—	—	10
China do.	12	20	20	17	25	27	18	22	23	18	10	17	20
Flint	20	20	18	15	25	14	20	20	16	20	19	17	20
Cornwall Stone	3	—	2	3	—	3	2	3	4	2	1	—	2
Parts	100	—	—	—	—	—	—	—	—	—	—	—	—

The Clay slips 24 oz., Flint 32 oz., Stone 28 oz. to pint. No. 12 is Mr. Spode's. (For Glaze, see Blue Printing Glazes, No. 8.)

Blue Printing Glazes.—Nos. 1 and 2.

Fritt.		
Glass	16	16
Red Lead	5	4
Arsenic	1	1
Nitre	1	1
Blue Calx	1½ oz	1

Glaze.		
Glass	—	35
W. Lead	42	28
Cornwall Stone	33	14
Flint	4	3
Fritt	21	20

No. 3. (*Meigh's.*)

Fritt.	lb.
Glass	18
Red Lead	2
Arsenic	1
Nitre	1
B. Calx	3 oz.

Or	
Glass	45
Pearl Ash	3
B. Calx	3½ oz.

Glaze.	
Fritt	20
W. Lead	46
Cornwall Stone	29
Flint	5

No. 4. (*Meigh's.*)

Fritt.	
Glass	20
Arsenic	1½
Nitre	1½
Borax	1

	Or	Or
Glass	50	50
Red Lead	6	6
B. Calx	7 oz.	7 oz.

Glaze.	
Fritt	12
W. Lead	50
Cornwall Stone	26
Flint	12

No. 5. (*W. Moore's.*)

Fritt.	lb.	Glaze.	
Glass - - - -	20	W. Lead - - - - -	50
W. Lead - -	$1\frac{1}{2}$	Cornwall Stone -	26
Salt - - - - -	1	Dry Flint - - - - -	12
Arsenic - -	4 oz.	Fritt - - - - - -	10
B. Calx - -	4 oz.	Borax (calcined) -	2

No. 6. (*Wilson's.*)

Fritt.	lb.	Fritt in gloss oven, then add		Glaze.	
Glass - -	24	Glass -	130	W. Lead - - - -	49
Lead - -	5	B. Calx -	9 oz.	Cornwall Stone -	24
Arsenic -	1	Grind at Mill.		Fritt - - - - -	19
Nitre - -	2			Flint - - - - -	8

No. 7. (*Spode's.*)

Fritt.		Glaze.	
Glass - - - -	20	Fritt - - - - -	12
Flint - - - -	6	W. Lead - - - -	50
Nitre - - - -	4	Cornwall Stone	24
Borax - - - -	1	Flint - - - - -	6
B. Calx - -	4 oz.	Glass - - - - -	8

No. 8. (*Spode's.*)

Fritt.	lb.	Or	lb.	Glaze.		Or lb.
Glass - -	34	Flint - -	16	Dry Fritt - - - -	20	18
Arsenic -	2	Nitre - -	4	Flint - - - - -	6	5
Nitre - -	2	Red Lead -	4	Cornwall Stone -	30	28
Red Lead -	10	Borax - -	8	W. Lead - - - -	50	49
B. Calx -	1					

Grind with 100 lbs. Glass at mill. A few ounces of Nitre melted, in each charge, before dipping.

No. 9. (*Spode's.*)

Calcine, pick, pound, and sift Cornwall Stone, in 6 saggers,
Fritt—Cornwall Stone 60 lbs.
Borax - - - - 30
Dry Flint - - - 30
in bottom of gloss oven; sufficient for three portions of Glaze.

To two saggers add for one Glaze,

	lb.	Or
W. Lead - -	340	54
Cornwall Stone	160	26
Flint Glass - -	56	10
Dry Flint - -	28	6
Pearl Ash - -	15	3
Sal Ammon. -	$4\frac{1}{2}$	1
		100

No. 10. (*J. Yates.*)

In 2 saggers, washed with Flint, put - - - -	Cornwall Stone -	53 lbs.
	Salt - - - - - -	2
	Borax - - - - -	2
In 1 sagger do. put - -	Dry Flint - - - -	30
	Borax - - - - -	4
Do. half inch thick - -	White Glass - -	34
	Nitre - - - - -	1
	W. Lead - - - -	4

Fritt in bottom of gloss oven; pick, pound, and sift; grind at mill; stain with $5\frac{1}{2}$ lbs. of Stain (No. 2, of Raw Glazes, afterwards specified). Grind well 113 lbs. W. Lead; then add Fritt; mix well, and pass through 16 lawn.

No. 11, Improvement on No. 10. (*J. Clowes.*)

Into 1 sagger put		Into another,	
W. Glass - - -	34 lbs.	Dry Flint - -	30
W. Lead - - -	4	Borax - - -	6
Salt - - - -	2		
Nitre - - - -	1		

Pick, pound, and sift through a $\frac{3}{16}$ riddle, mix well, and fritt in gloss oven; then again pick, &c., carefully; and the same with 53 lbs. calcined Cornwall Stone; grind

at mill; then add 113 lbs. best W. Lead, and 5⅜ lbs. Stain, (No. 2 of Raw Glazes.) In each preparation, 17*s.* 8*d.* is saved; and J. Clowes says, this is a much better Glaze.

No. 12.

Mix well.		also with		Fritt in gloss oven, and grind with 48 lbs. glass.	Glaze (Blue).	
Glass	32 lbs.	Nitre	1 lb.		W. Lead	51
Corn. Stone	10	Soda	1		Corn. Stone	27
W. Lead	4	R. Lead	2		Flint	10
Pearl Ash	4	B. Calx	2 oz.		Glass	4
Borax	4				Fritt	8

No. 13.

Calcine in gloss oven.		Grind well for use.	Glaze.	
W. Lead	12 lbs.		Fritt	4
Borax	6		W. Lead	50
Soda	4		Cornwall Stone	28
B. Calx	4 oz.		Flint	12
Then add Glass	60 lbs.		Do. Glass	6

Raw Glazes.—(Blue Printing.)

No. 1. (*Davenport's.*)

		Flux, without fritting,	
W. Lead	49	Salt	14 oz.
Cornwall Stone	22	Borax	12 oz.
Flint	7		
Glass	22=100 parts.		

No. 2. (*J. Barlow's.*)

		Stain.		
W. Lead	49	W. Lead	2	Fritt in top of biscuit oven, then pick, pound, sift, and grind.
Composition	24	Nitre	½	
Dry Flint	14	Salt	1	
Glass	10	Glass	30	
Stain	3=100 parts.	B. Calx	10 oz.	
Add Dissolved Borax	2 oz.	Borax	1 lb.	

No. 3. (*W. Moore's.*)

		Without fritting		
W. Lead	52	W. Lead	51	1 oz. Blue Calx, washed in 4 oz. of Salt Rock.
Cornwall Stone	24	Cornwall Stone	25	
Flint	12	Flint	12½	
Do. Glass	12=100 parts.	Do. Glass	11	
Blue Flux, 7 oz. } 1½ Flux to 1 Blue. }		Potash	½=100 parts.	

Glazes for Enamel, or Blue Edge.

No. 1.

Grind for 24 hours,		Then dissolve in hot water, and add
Flint	20	40 oz. Borax,
Glass ½	20	24 — Oxide of Tin,
Cornwall Stone	60	8 — Nitre,
		16 — Salt,
		190 lbs. Lead.

When sifted, send to mill, and add 3 oz. B. Calx before it can settle, else liable to blue spots.

No. 2.

Fritt, in gloss oven, 1 sagger washed { Flint 25 lbs. Borax 8 } Grind with Cornwall Stone 57 lbs., and add W. Lead - 117 lbs.

1 sagger flinted		Raw Glaze Stain, No. 2. ½
Glass	22	Or with do. 2½ for a very excellent Blue Edge Glaze. The Stain to be twice ground and sifted.
Salt	1	
W. Lead	2	
Nitre	0½	

No. 3.

Fritt.		Or		Glaze.	
Glass - -	50 lbs.	Glass - -	10 lbs.	Fritt - - - -	10
R. Lead -	$2\frac{1}{2}$	R. Lead -	1	W. Lead - - -	50
Bone - -	50	Arsenic -	8 oz.	Cornwall Stone -	26
Salt - -	2	Nitre -	8 oz.	Flint - - - -	14
B. Calx -	5 oz.	B, Calx	3 oz.		

	No. 4 and 5	
Glass - - - -	17	6
W. Lead - - -	55	54
Cornwall Stone -	21	28
Flint - - - -	7	12
B. Calx - - -	1 oz.	$1\frac{1}{2}$ oz.

No. 6.	
B. Pr. Gl. No. 1 Fritt	13
W. Lead - - - -	52
Cornwall Stone -	23
Flint - - - - -	12=100 parts.
Flow with Salt -	6
Nitre - - - - -	4

THE NUMERICAL INFLUENCE OF POPULATION ON THE HAPPINESS OF SOCIETY.

Sir,—In a late No. of your periodical, there is a long and able letter signed "R," under which signature I conceive that I recognise a well-known benevolent friend of his species. His views of society seem generally correct, and his desire of human improvement so strong, that it pains me to observe the total indifference, nay, almost ridicule, wherewith he regards the question of population,—a question upon the right understanding of which it seems to me every proposition hinges which regards human happiness or improvement. If I am wrong in my view of the subject, I am so in unison with many others who have not lightly studied it, and I must confess I should not hold my obligation small to that man who would convict me of error. It would "move a mountain's weight from off my breast," which will remain there until such a conviction shall be wrought in me and those who think with me, or till the opposite conviction shall be acknowledged by all men capable of influencing their fellows. I have no prejudice on the matter. My present conviction is the result of earnest thought. I profess to be no especial disciple of Malthus; I have not even read his work. His principle, however, is in the mouth of every one who has talked on the subject. I fully agree with "R," that the chief end of human life is human happiness, and I consider also, that giving human beings "many physical and intellectual wants, and ample means to satisfy them," is the best mode of reclaiming man from the condition of a savage, and making his nature shew like that of a god. The most degraded savage is generally the man of the fewest wants. Attempting to educate a hungry man, whose sensations of pain make him think more of his mind than his body, is, as "R" remarks, absurd. "R" states, that there is "a want of employment for the working classes;" but surely this can only be another mode of expressing that there is a want of food. We may talk as we please of money, but the ultimate wages of labour consist in food and necessaries, especially the former. Now, if a surplus of food existed in the possession of the rich, it is scarcely to be imagined but that they would pay it away to the poor or working classes, for the fabrication of new luxuries, which the wealthy are always craving. And as we know that numbers of the labourers are but half fed, the conclusion must be that the food exists not.

But "R" offers the following remedy. Divide the land of one ploughing farmer—100 acres—amongst thirty-three spade labourers, and it will support 132 persons instead of eighteen. I am content to admit, for the sake of the argument, that the farmer with his eighteen would have no more surplus produce for sale than the labourers with their 132, but we must suppose that the farmer at any rate could increase his produce with the increase of his family. But what would the labourers do with their families, when they come to average more than the starting stock of "four persons each?" Their comforts would be sadly trenched on if they increased to eight—mind they are not to stir off the hundred acres—that is their island—and if they increased still more, they would be in "the grovelling state of wretchedness of the Laboures' Friend Society." I would ask "R" what is to prevent this? Would the "good wife" he speaks of, have con-

sidered children a "comfort," when surrounded by a numerous progeny, unhealthy, famished, and clamouring for bread which she had not to give? I have, I confess, a fear of spade husbandry; for somehow it constantly associates with potatoes, and potatoes bring Mr. Cobbett's anathemas on them to my recollection, and unhappy potatoe-fed Ireland before my mental vision. Spade husbandry will undoubtedly procure a larger crop than any other method as yet known, but it is only by the extra exertion of human labour, which causes a privation of leisure time for other purposes. It is already the curse of Britain that labourers and mechanics work the *whole* of the day, instead of retaining a fourth part for the recreation of the body and the cultivation of the mind, and that the very children have their energies destroyed in early youth, by premature labour. Let it not be supposed that I in any way decry the married state, and its numerous train of truly holy joys. I merely decry the increase of the population beyond the supply of food; and if "R" will shew by what process his 100 acres are to maintain the 132 multiplied by 2, or perhaps 4; or, if that should startle him, if he will shew how the total number is to be kept down to the 132 without increase, then will I cheerfully say to all the world, Marry in God's name! I will presume that "R" has stated the largest number which can be maintained in comfort on the 100 acres, with the maximum of produce. Now, supposing the 100 acres to represent England, I maintain that the primary cause of the physical misery the labouring classes endure is, that their number has exceeded the 132. But that is not the case with England at large, "R" will affirm. "The country has within herself sufficient resources with which to supply more than double the present population,—great as that number may appear." I am willing to grant this, even though the number be quadrupled, aye, and without the detestable spade husbandry, which is as great a waste of human industry as spinning by hand. Human science and human improvement appear to be almost illimitable, but they are not spontaneous: long study and exertion are requisite to success, and whilst the grass grows the steed may starve. I am not arguing that it is necessary to keep down the total number of the population to what at present exists, or to any specific number. I merely wish that the gradual increase of food, and a surplus, should *precede* the gradual increase of numbers; for by reversing the process, as the greater portion of mankind have hitherto done, a large amount of horrible misery has been produced. I am sure that "R" is too benevolent a man not to agree with me, that it is a desirable thing if possible to extinguish this misery.

I believe the gist of the argument of Mr. Malthus is, that there is a constant tendency in human beings to outgrow their food; in the phraseology of his sect, "population is constantly pressing against the means of subsistence." I will go farther than this, and, confident in my position, make a wider and more sweeping assertion. *Every production of organised nature, whether animal or vegetable, possesses an inherent tendency to increase its species beyond the means of efficient support.* And this is a universal law of nature, without which every species would become extinct. Only to the human being is it given, by the exercise of reason or forethought, to limit the number of the species to the amount which can exist in happiness, without the necessity of any being killed off, or dying of want, like the "beasts that perish." "R" is a naturalist, and the love of nature has brought forth good fruit in him, to the enlarging of his intellectual perceptions and humane feelings. Can "R" point out a tree which does not produce every year an enormous amount of seed, almost the whole of which is destroyed? Can he point out an annual, or perennial, which does not supply either seed or offsets to multiply itself many fold? How many embryo oaks and beeches are destroyed by the pigs, which in the phraseology of Tabitha Bramble, are "fed for baking with bitch mast, and acorns." Where would land enough be found, were every fir cone planted?—What would become of the fruit of the apple tree, were suckers allowed to spring *ad libitum* from its roots? What would the strawberry-bed produce, were it not annually thinned of its surplus number of plants? "Cortez," I once remarked to a gardener in Chile, "what has your mellon patch done to offend you, that your are thus trampling it down?" "*Senor, se da en vicio,*" was

his reply. "Senor, it has gone to vice." The fact was that the vines were too numerous, and produced no fruit, just as wheat sometimes runs to stalk. He, therefore, was trampling them down with his feet, to kill off a portion, and thus suffer the fruit to grow upon the remainder. I need not multiply instances, because "R" must agree with me, that every vegetable which reproduces its kind, yields in seed or offsets an amount far beyond what is needful for keeping up its numbers. Take a cabbage, for example, or the familiar grain of mustard seed, whose increase of numbers is far beyond even the proportion of its stature. If we turn to the animal species, we still find the same law prevail. When animals run wild, their numbers are only kept down by starvation, as is the case with the wolves at times, or by the thinning made amongst them by those who feed upon them. The horses and black cattle of the Pampas increase, till a scarcity of rain, and consequent scarcity of pasture, occurs, and they die by thousands of famine. Amongst the carniverous animals, one race preys upon another, and man upon all. Mrs. Barbauld's Brahmin story is a true picture. The little bird picked up the ants, and then the story runs on, like that of the woman driving home her pig in the nursery tale, till at last the soldier wanted to eat some of the sacred cow of Brahma. What would become of us were we to allow our domestic animals to breed to an unlimited extent without killing them off? What then would stop their increase? What but want of food? What if the numbers of our dogs and cats were not limited by drowning the supernumeraries at birth? Should we not be obliged, like Robinson Crusoe, to shoot them like wild beasts, or to slay them like rats and mice? What but surplus breeding could keep up the numbers of the two last named persecuted animals? It is needless to multiply instances. Those who will not be convinced by such as are adduced, would not believe "though one rose from the dead." Wherein are human beings exempted from this universal law of "eat or to be eaten," which takes place alike amongst birds, insects, reptiles, beasts, fishes, and vegetables? The ivy kills the oak, and the fungus take possession of the spoil. Many races there are, which are preyed on by the stronger, and which prey on the weaker, but there are many also which prey upon one another. Amongst men, the New Zealanders do it, urged by the same motives as a wild beast; and, descending downwards, we find tadpoles doing the same thing. In what we call civilized society, over-peopled, a different sort of 'preying takes place by the seizure of food, the strong at the expense of the weak. In natural forests, there is usually too great a number of trees for the space, and they spire up together, and, depriving each other of light and air, are mutually mischievous. The seed which drops from trees thus incommoding each other, even if it germinates, cannot grow up. There is no room for it. It is strange that man can see the cause of the defects of most things in nature, yet cannot see the cause of his own defects. He takes a crab from the wood, and by giving it room, and plenty of nutriment, he makes it into an apple. He takes a timber tree and works a similar improvement, or if he fails, it is only because he has not well studied the nature of it. He takes a wild scrubby kail plant, and breeds it into a sugar loaf cabbage or a cauliflower, or a brocoli, white, red or green. In fact, when he gives time and attention to it, he improves the breed of every thing, animal and vegetable, that he takes in hand; by improvement I mean, that by his reason he alters its nature to suit his own purposes better, and, if he chose, could alter it for the worse. But were he to leave his animals and vegetables without care, they would again degenerate; the cabbages would become nondescript; the apples would become crabs; the hautboys would become mountain strawberries, the smallest and meanest variety; the horses would become Welsh and Shetland ponies; the Leicester cattle would become Highland stots; the sheep would become half goats; and the dogs would all return to the state of curs from whence they sprung. It is the care of man, which by selecting the best and healthiest, and keeping down their numbers to what can be efficiently maintained, has improved their quality; and they would again deteriorate by neglect. Again I ask "R," if he can point out any thing, wherein the animal man is exempted from the laws which govern the rest of the organized creation, save and except in the godlike attributes of thought

and reason, which teach him to curb his appetites in those things which are detrimental to his well being. We may readily remark, that those classes of human beings which have been exposed to physical want, have deteriorated below the middle standard, both in mental and physical capacity, while those who have known no wants have improved. It is a subject of deep interest to human nature, and I would request of "R," ere he answers this letter, to read once more what I have advanced in the *Producing Mans Companion.* I would not that a man like him should scoff without deeply weighing, and when he is girded for the strife.

"I will fight with him upon this theme,
Until mine eyelids will no longer wag."

In the hope that truth will spring up between us.

I remain, Sir, yours, &c.

JUNIUS REDIVIVUS.

HALL'S IMPROVEMENTS IN STEAM ENGINES.

Sir,—The condescension of Mr. J. Ride, p. 324, will, I trust, be duly appreciated both by yourself and your readers, as it is solely for their sake, and for the utility and advantage of your magazine, that he has deigned to discuss at large my former paper. For my own part, had not this very *elaborate* discussion charged me with making exaggerated statements, I should have treated it with the contempt which I conceive it merits.

Mr. Ride endeavours to evade the charge of complexity in the piston, by pretending to imagine its appearance on paper as calculated to deceive the eye; and says, as the cover and bottom are cast so as to fit into the middle block, there is, in fact, no difficulty in fitting up and putting them together;* but although I have heard of the superiority of casting in his part of the country, I cannot for a moment suppose that the several parts are cast with all the holes ready screwed, thereby avoiding the necessary labour of drilling, shouldering, and tapping them. "Audax", who wisely confines his remarks to the piston—no doubt considering that his practical knowledge must add weight to his opinion—gives a fair specimen of his sagacity in having discovered that six times two are only six, although at the same time he pronounces six times four to be equal to twice twelve; or, in other words, he has taken the monosyllable *each* in the first instance to mean but *one*, and in the latter as meaning *both* the sections. It is useless, however, to enlarge on this part of the subject, though I must confess I should have been more precise could I have believed that any *one* of your innumerable readers would have so misunderstood me. Of this I am quite certain, that the idea of six piston rods could never enter the imagination of any mechanic. After all, it is in the power of this *bold* piston-maker to prove at once whose assertions are most correct, by a simple statement, in figures, of the comparative cost of a piston on the old, and one on the new construction.

Mr. Ride asserts that I am mistaken in supposing that Mr. Hall is speaking of his patent valves, when he says that "large working surfaces are rendered untrue by the application of heat." Now, if the assertion is true with respect to the seat-plate of common slides, how is it that the patent ones are not equally affected? For I do not remember any claim for a reduction of the working surfaces. Or supposing, as Mr. R. says, that Mr. Hall is to be understood as holding the patent surfaces exempt from the action of heat, what necessity is there then for adjusting screws?

With respect to *apologising*, as Mr. Ride has no doubt settled the matter with Audax, there is not the least occasion for troubling himself on my account, as I consider it to be just the same whether I reply to one or *both*; their reading and reasoning being equally *correct* and *judicious*, and both appearing alike intimate with the works of our immortal bard. I beg also to inform them that I cannot admit as proof, the simple assertions of interested persons, who appear not over nice in what they vouch for. Instead of answering my query as to the condensation caused by injecting a quantity of cold air, he begins by *supposing*, and supposes a pint per minute may be an ample lubrication for a 10-horse engine:† but I must decline the investigation he has left

* This is a mere *ruse*, for although the complexity of the piston must be increased with the multiplicity of its parts, still in the common acceptation of the term, there may be no difficulty in its construction.

† As the lubrication is carried on *ad infinitum*, if it is not asking too much, I should wish to know how long it is from the starting of the engine, before the oil first injected comes into use again?

to my sagacity, until he has shewn how the 80th part of a pint, or less than half a cubic inch, flowing over a level surface of little less than two feet, can form such a stratum as must have been contemplated by the inventor, when he said, "The escape of steam by the working piston and valves is effectually prevented by the uniform and *plentiful flow* of oil, a stratum of which is formed, and constantly floats on the upper side of the piston, hermetically sealing any passage between it and the sides of the cylinder."

Mr. Ride evidently mistakes *vacuum* for *plenum*. If he turns to p. 271, he will find the question I asked does not concern the filling the pipes with water, but the vacuum produced at the ends of them by the working of the air-pump. He states that the vacuum so produced extends no farther than the chamber which connects the ends of the pipes with the air-pump, the pipes themselves being full of water, and that the steam is converted into water the moment it enters them. These are certainly the most extraordinary assertions that ever man persisted in. The pipes, as he says, being always full of water, they can hold no more; by what law of nature then, I should like to know, can steam possibly find its way into them, even though it be condensed instantly? It must be quite clear to every one, that, to keep these pipes always full of water, nothing but water must ever enter them; consequently all the caloric must have been previously abstracted that was necessary to produce a vacuum; and any further reduction in the temperature, whatever that may be (whether known to me or not is of no consequence in the present case), by passing it through the refrigerating pipes must be useless, or worse than useless: and as a natural sequence to his repeated declaration of the instantaneous conversion of steam into water, it must be the height of human folly to talk of its taking thirty hours to abstract the caloric contained in steam!!

Before finally quitting this part of the subject, I must once more revert to the patentee's most lucid explanations. He states his improved method of using metallic surfaces (their exterior being in contact with cold water) "consists in keeping them *full* of the water resulting from the condensation of steam, which becomes the internal condensing water;" and further he says, "my invention, therefore, does not consist in the application of metallic surfaces generally, but in keeping them occupied by water instead of steam." Then, in describing the caps, he says, "in the upper part of each cap a hole or holes must be made, to allow the steam, air, water, &c. &c. to enter into the pipes." Now pray what is all this but nonsense? To talk of steam, air, &c. being allowed to enter into pipes which are *always kept* "*absolutely full of water!*" But to the truth of all these manifold as well as manifest contradictions, the *sapient* Mr. J. Ride pledges himself, as facts which he has witnessed!! Why, your readers must imagine that, instead of being in possession of the infallible rule he vaunts so much of, he positively cannot have sufficient ability to know what it is he really does see. But to return to what is called the internal condensing water — the only part of it that is allowed to act as such upon the steam, is confessedly hot (see p. 184), and exposes a surface equal only in area to the eduction pipe, that being the stated aggregate area of the holes in the caps; and the pipes being absolutely full, the steam, on coming in contact with those minute surfaces of hot water, is instantly condensed in a most marvellous manner, when forcing its way into the refrigerating pipe, it displaces a great quantity of comparatively cold water for the service of the boiler! Enough of this trash.

Mr. R. in another attempt at witticism exhibits an incongruous medley of prophets and lubrication, pistons and chronometers, &c. &c.; but as it in no wise affects the matter in dispute, I shall pass to his *happy calculation*, and there can be no doubt but that he must have again been imbued with the spirit of prophecy, when alluding to the amusement it might afford some of your more juvenile readers; for most assuredly a more erroneous statement was never before made. The true problem to be solved, is, not the power requisite to pump a given quantity of water per minute to the height of 33 feet; no, nor, in most cases, to the height of as many inches; for could the injection water be got rid of by any other means, the air-pump bucket would still have to sustain such portion of the atmospheric pressure as was due to the vacuum formed in the condenser; therefore "the power requisite to work the air-pump solely on account of the injection water," is simply

no more than is sufficient to raise it to the top of the air-pump.

Mr. Ride's reference for a statement of the saving in fuel, (p. 90) must be taken as a tacit admission that he knows nothing about it; which is certainly not very creditable to one taking so prominent a part in this *important discussion*. However, at the page above referred to, it is said that the consumption of fuel by the engine previously in use, on the old plan, was 22 cwt. in twelve hours, and doing full 30 per cent. less work than it does, now it is fitted with all the improvements, although consuming but 9 cwt. I shall take the liberty of putting this statement in a more tangible form. To make the comparison worthy of any attention, we must (in the absence of more definite information) suppose the engine previously in use, to have been on a good construction, well made, and in perfect repair, and of course capable of working up to its full power, which, if the fuel was good, would be about 20 horses, and that added to the above named per centage, gives a power equal to 28 horses for a consumption of 9 cwt. of coal per day!

I remain, Sir,
Yours respectfully,
J. V. Robson.

CARRIAGE BUILDING.

Sir,—In No. 497 Phæton objects to my proposition for making his strengthening plates of landaus of gunnel iron, on account of the extra "skill, labour, and expense" which it would require. If his objections be well founded, what becomes of the assertion of the reviewer of the *Foreign Quarterly*, that a best London-made carriage is nearly perfect?" If the "skill and labour" requisite for making so evident an improvement as a perfectly rigid body, would be too "expensive," it must be evident that carriage smiths are not first-rate workmen, and that sufficient pains have not yet been taken in the construction of carriages. But when I look at the many strange-shaped pieces of iron which are found in a carriage, commonly in pairs, right and left, yet both equally accurate, though without a single straight edge to work from, I cannot believe that carriage-smiths are skilless workmen, but, on the contrary, that they must possess what is technically called "a good eye." I therefore incline to think that Phæton has not duly considered the matter of the edge-and-flat, or gunnel iron plate, I propose. That extra labour would be required in it I grant, but as for the "skill," let Phæton send his smith to the coppersmiths, and well examine the process of hammering whereby angular metal is shaped to any form, and he will get over the difficulty. The edge-and-flat plate should neither be welded, brased, nor riveted; it should be of solid rolled metal; in short, gunnel iron; hammering on the outer edge of the edge plate will curve the upper one to any form requisite, after the necessarytapering has been performed. The bottoms of landaus may not be regular curves, nor all alike, but I should imagine that each builder has a mould from which he does not greatly vary. I imagine, also, that the iron is at present, from Phæton's description, fitted to the wood. Now would it be very difficult to reverse the matter, and fit the wood to the iron? Then, when one pattern of plate had been decided on, the smith would make all alike, and the variation, which I should suppose rarely more than half an inch in the curve, could be accommodated in the wood—lightening it off to the moulding, just as the pointed streak of a ship is sometimes made to leave the line of the wales, for the sake of a better appearance.

But Phæton does not want the landau to be unalterable, or rigid, because the leather work of the upper part is apt to contract and expand. Surely then it is an evidence that landaus are very far from "perfection," or some other material would long ago have been substituted, not subject to such objections. As for difference of temperature affecting the metal, there may be something in that; but if there be, it must be that the contraction in winter would diminish the curve of the plates, owing to the resistance of the wood between them, and *vice versa* in summer. But this I cannot allow unless Phæton positively *knows* it, for I incline to think that the very trifling contraction would be relieved by the yielding of the wood to the bolts, by their straining, or their inaccurate fitting in the iron work. The "solid rocker," being of wood, must be anything but a rigid substance, and would acquire a "set" by the weight placed on it, just as much as the timber framing itself. Phæton is

very honest in his acknowledgment, that in carriages "apparent lightness is gained by adding real weight," and in return for this acknowledgment, which puts the reviewer of the *Foreign Quarterly* out of court, I will not insist upon the apparent advantage the coach builder has in not making his landaus too rigid, and in thereby increasing the amount of the bill for repairs and alterations.

I still adhere to mine opinion, in favour of the double elliptic springs, and account the circular C springs heresy, part of whose action is expended in trying to tear the "carriage" end from end. The elliptic springs have been ill-used, and, in fact, so have all springs connected with carriages. Did Phæton ever use a bow—not that return-curved thing which his father Apollo made use of to slay the children of Niobe, but an honest English long-bow, made of Turkey yew, and fitted to drive a cloth-yard shaft through—one of the landau pannels, stuffing and all ? The bow-makers, a class of men towards whom my heart always warms, notwithstanding they are, like gardeners, somewhat crotchety—the bowmakers mark on their bows certain figures, from twenty up to ninety, indicating thereby, the number of pounds weight required to draw them to the extent of the arrow. By this means, they are accommodated to the strength of the shooters, and coach builders might thence draw a useful lesson in accommodating their carriages to the weight intended to be placed in them. Much useful knowledge is lost among mechanics, for want of a more intimate acquaintance with each others mechanical pursuits. The engineer might learn from the carriage builder, and they might both together acquire something from the cabinet maker. Who could ever use the flimsy deal work-bench of the carpenter after looking at the excellent one which the cabinet maker uses? No man should be allowed to work in metal, till he could work "true" in wood. If a boy begins his learning in practical mechanics, with a stubborn material to work on, there is a great probability that he will "scamp" his work, and, what is worse, acquire the habit of so doing. But the habit of working neatly, and accurately, being once acquired, can never be abandoned, whatever be the material employed. It should be borne ever in mind, that in mechanics, the words of Pope are literally true : "All are but parts of one stupendous whole."

With the exception of a kind of light gig, called a "sulky," which is much used by Jonathan in the American Union, when travelling for trading purposes—and some of which vehicles weigh less than seventy pounds, though placed on very high wheels,—with that exception, I believe, or at most one other, all wheel carriages are built to carry one or more persons. In the case of machinery, all springs are adapted to the precise strength requisite, or arrangements are made to balance them with the change of circumstances, as in the case of a watch. But with regard to carriage springs, the circumstances are continually changing, and no arrangement is made to provide for such change. For example, a modern chariot,—a very different thing from the sulky of the sun-god—is mostly made to carry two or three persons inside, a fat coachman before, and a muscular flunkie behind. Now, the springs may be adapted accurately to this given weight, and the requisite elasticity, and no more, permitted. But, supposing that one person only wishes to ride, and the flunkie is omitted, as sometimes happens in "respectable" families who keep more carriage than dinner, where he is obliged to play the part of factotum,—what then will become of coachee and his master or mistress? Surely, the springs, not feeling their accustomed weight, will rebel like an unruly horse with a boy on his back, or like the omnibus Phæton mentions, for which kind of vehicle I have a most plebeian liking when inclined for a ride—not an airing. The air is something like that of a crowded theatre ; but then, to compensate for it, you have mostly a play, acted after nature's own model, in gazing on the variety of human beings who "make their exits and their entrances." But sometimes the chariot is in the opposite extreme when prepared for a journey. It is then loaded with luggage, and an extra human being or two, and the foundered springs get a new "set" beneath the unwonted weight. Now, is this fair treatment for any piece of mechanism? Would it not be an improvement, at least in private carriages, to have the springs constructed for a given weight, and never to suffer more to be placed in it than the carriage was intended for? And in case

of only one person riding in it, would not the simple mode of keeping the springs at their common working tone be, to supply the absence of flesh and blood by weights of lead or iron conveniently arranged, just as a ship takes ballast on board, when her cargo is discharged? Wherefore has this never been thought of in the "perfection" of carriages? As for Phæton founding an objection to elliptic springs, on the fact of an omnibus being uneasy with only one or few persons in it, it is what the gentlemen of the long robe would call "begging the question." The omnibus is in the first place a hack carriage, and not supposed to be "perfection." In the next place, the springs are intended to bear the weight of seventeen persons, conductor included; and, probably for the sake of guarding against accidents, they are averaged up to the strain of twenty-five persons; consequently, they are not very easy even when full, and when nearly empty, they are—admirable for indigestion—being, in fact, like a cart without springs, or an antique war-car. Not being "respectable" enough to possess a "medical friend," I have no chance of experimenting in a "pill-box chariot," and as for the matter of hats,—alack and welladay!—I have nothing of a "Sunday-going" nature, my surplus capital not permitting more than as many hats as heads, shoes as feet,—sometimes less, if unsound ones do not count.—Ah! what a sensation of independence it causes when one's shoes are new-soled!—It was this fact which principally moved me to the invention of a hat not likely to wear out rapidly.

With regard to the engine part of a common road steamer being without springs, the reviewer of the *Foreign Quarterly* has satisfactorily shown, that it would in such case be useless.

I will not hear of Phæton quarrelling with me, because I happened to jest on slang terms in use amongst the "genii" * of wheels. He seems far too worthy a man to be quarrelled with, and my mind sadly misgives me, that, after all, he does not belong to the guild. But he must not altogether run down "slang," for there is much quaint and racy matter amongst it, mingled with much rubbish, which it is worth the while of the philologist to extract. People in general, when they declare it to be low, are not aware of the antiquity of many of the words, which were in high esteem "till they came to be ill sorted, and as odious as the word occupy." I purpose writing a paper on the matter, instead of going to Greenwich next fair.

Phæton mistakes me in supposing that I imputed money-getting as the peculiar vice of carriage-builders. It is "national," as he well observes. I wish it were national in a better sense, and not so purely individual and selfish. I merely mentioned the fact incidentally.

"The expensive experiments at this day going on to bring a steam carriage to perfection" make out my case, that the "principles of science, when known by coachmakers, will make expensive experiments rare." When Phæton has shown where the "science and talent" exist amongst the present experimenters—I allude to the "roadsters,"—I shall acknowledge my argument unavailing. It seems to me that it is the absence of science and talent which is the cause of the *expensive* experiments. All imperfect workmen spoil material.

I remain, Sir,
Your's, ever,
JUNIUS REDIVIVUS.

March 12, 1833.

* Slave and geni were equivalent in Aladdin's ring.

SIMPLE MODE OF POLARISING LIGHT.—SUBSTITUTE FOR CATGUT BANDS.

Sir,—I have no doubt that many of your readers would try the experiment of polarising light, if it were not for the complicated description of the process which is generally given in works on optics. Perhaps some of the experiments may require the glass to be placed at the exact degree and minute, but there are others which may be seen at once by holding the glass in the hand. As Dr. Kitchener observes, "that which is most worth seeing is easiest seen." Take a piece of common glass; lay it on the crown of a hat placed close to a window, so as to reflect the light of the sky; then take a smaller piece in the left hand, and lay it on the ridge of the nose, pointing it to the left side of the glass on the hat. Look now through the small piece, with the right eye, at the light of the sky reflected from the large piece; then take the substance to be tried in the right

hand, and bring it between the glasses so that the light reflected from the large piece shall pass through it. By this simple means, the splendid phenomena of polarised light may be laid open to all. The substances best adapted for this purpose are thin plates of talc, mica, sulphate of lime, mother of pearl, rock crystal, from the $\frac{1}{100}$th to the $\frac{1}{25}$th of an inch thick. The last gives most beautiful rings of colour, a circumstance which, by the bye, furnishes a very elegant test of the genuineness of articles made of this material, and may enable any person to detect the impostures of the unprincipled fellows who go about the country selling *glass* for *pebble* spectacles. The only specimen that I possess, when placed between the glasses, appeared full of the most splendid rings of coloured light. Whether the plates are always cut from the same part of the crystal I do not know, and that would perhaps make a difference, as the plates for some of the experiments require to be set perpendicular to the axis of the crystal. Soft ones, such as nitre, &c., are ground flat, and then cemented with varnish between two pieces of glass, which produces all the effect of the most perfect polish.

I have found that strips of common white leather, from the $\frac{1}{26}$th to to $\frac{1}{4}$ inch thick, twisted, will answer the purpose of catgut for drilling, and also for small hand turn benches. For the latter purpose they require no joining, if cut from a round piece of the right size; they possess a small degree of elasticity, and they have a tendency to wear smooth, while catgut is apt to wear rough, and when once a fibre gets loose they soon wear out.

I remain, your's, &c.

G. Dakin.

Dereham, March 20, 1833.

CONDENSATION OF ATMOSPHERIC AIR.

Sir,—Your correspondent ϕ. μ. has given a very satisfactory reply to my inquiries about the condensation of air. I am greatly obliged to him for it, and it pleases me the more, because it accords with my own conclusions, as deduced from a series of experiments in which I have been engaged during the last two months.

This subject presents an interesting field for further inquiry, experiment, and observation. Those who possess the means, and have sufficient leisure, will do well to direct their attention to it.—The following observation by Dr. Lardner, in his Treatise on Heat, page 179, note—is worth quoting:—'An opinion, which I consider to be erroneous, has hitherto prevailed that gases and vapours may be condensed by mere mechanical compression. I conceive that mechanical compression contributes in no other way to the condensation of a gas or a vapour, than so far as it is the means of raising the temperature of the gas compressed, and therefore facilitating the process by which it may be deprived of heat.'

The justness of this inference cannot, as I conceive, be disputed. We are, therefore, in full possession of the conditions that are requisite for liquefying gases and vapours — viz., mechanical compression, accompanied by refrigeration. Whether we shall ever make much further progress in this branch of science, and ultimately succeed in liquefying atmospheric air, is a question that time only can solve. A more active refrigeratory process than we are at present accustomed to employ, seems essential to the experiment.

Dr. Lardner intimates, page 180, that it is strictly conformable to analogy to conclude that what are usually termed permanently elastic fluids—*i. e.*, those which have never yet been condensed either by cold or by compression, are nothing more than the vapours of certain bodies whose point of liquefaction is very much below any degree of natural or artificial cold with which we are at present acquainted. To use the author's own words—'that all bodies whatever, existing in a gaseous form, may, by a sufficient abstraction of heat from them, be reduced to the liquid state.' May I not be permitted to add, if they may be reduced to the liquid state, what will prevent their becoming solid?

J. O. N. Rutter.

Lymington, March 8, 1833.

STREET OBSTRUCTIONS.

Sir,—"Private interest ought always to give way to public convenience," said a gentleman to me a few days ago, who was complaining of the nuisance of having gates at the ends of streets. He enume-

rated several, and proved they were daily inconveniencies to the adjoining public, who contribute to the paving, lighting, and watching of those very streets, the use of the passage along which, they are not permitted to share. To strangers, they are in the aggregate of still greater inconvenience: for after having traversed the whole length of, for example, Harley Street, they are not permitted to pass through to the New Road, to which they are destined, but must turn back, and seek to the right or left a road out. In this way a very considerable distance is frequently added to a previously long day's journey.

Having stated the inconvenience of so many gates, permit me now to complain that gates are so few. The parishes of Paddington, Marylebone, and St. George can, at various convenient places, enter Hyde Park; but the inhabitants of Sloane Street, and the neighbouring parts of Chelsea and Brompton, are not so favoured. The usual place of entrance for those who walk to take the air, is through the Horse Barracks at Knightsbridge, which, to say nothing of its inconvenience, must be admitted to be a most unsuitable place for *nursery maids and children*—governesses and their scholars, &c.

It happens, however, that there are two other places where more convenient entrances might be obtained. The one is near Mr. Goding's brew-house, where the stream from the Serpentine leaves the park. At this point, I have been told, Mr. Cubitt offered to turn over an arch, and make an entrance at his own expense, for foot passengers, but he was not permitted to do so.

The other place to which I have alluded, is directly opposite the foot barracks, near the end of Wilton Place, in Knightsbridge; where, indeed there is already a gate, but it is kept locked: occasionally, I have seen it open for soldiers. If this gate were thrown open, although not equal to the other entrance proposed, it would be a very great accommodation; and I cannot imagine there can be any reason assigned for not allowing it as an entrance.

Hoping your publication of the above may lead to greater accommodation for the public,

I remain, Sir,
Your obedient servant,
C. D. S.

NOTES WORTH NOTICE.

"Brevity is the soul of science as well as of wit. He who strives for riches or honours, always hopes to arrive at them as *shortly* as possible."

New North Polar Expeditions.—The requisite sum—three thousand pounds—having been raised by public subscription, and added to the two thousand advanced by government, Lieutenant Back has sailed from Liverpool for New York, on his mission to the polar regions, in search of Captain Ross. A new subscription has been likewise started, for the purpose of dispatching an expedition by sea for the same end, under the command of Mr. Ross, the Captain's brother.

Temperance at the Tropic.—*Temperance* Societies appear to suit *torrid* climes better than our own: they are now quite the rage at the Cape of Good Hope, where several thousand people have enrolled themselves members. In England, they do not seem to take.

Another Scientific M.P.—When enumerating the few men of science who have obtained seats in the first reformed House of Commons, we ought not to have omitted the name of Sir George Cayley, who was returned for Scarborough, in the room of the Speaker. Sir George is well known for his scientific attainments, and especially to the readers of the Mechanics' Magazine, which has often been honoured with his contributions.

Backward March of Improvement in the City.—The projected continuation of Farringdon Street to Clerkenwell, and thence to the Northern and Hollyhead road at Holloway, has met with a severe check, the Court of Common Council having determined, by a large majority, that the scheme be abandoned, at any rate for the present. The grounds of this decision are, the vast expense which the city would have to incur, and the want of funds to meet it. It is to be hoped that the difficulties will prove only temporary, and that so much-wanted and extensive an improvement will not be postponed *sine die.*

African Colonization 100 *years ago.*—It is not a little singular that the French, about a century ago, were on the point of establishing a settlement on the very spot of the African coast now occupied by the Negro colony of Liberia. Its objects, however, would not have been exactly the same as those of the modern settlement; one of the chief advantages of the situation, and that which carried the most weighty consideration with it, being its convenience for carrying on an extensive traffic in slaves. The proposer of the factory, Captain Des Marchais, dilates with much complacency (in his Voyage, publish-

ed by Père Labat) on the great advantages the establishment would enjoy, in being able to purchase the staple commodity at "first hand." The spot on which he proposed to erect a fort, is not far distant from the site of the present town of Monrovia.

Castles in the Air.—In the year of speculation, 1825, there were actually no fewer than forty companies set on foot for making railroads in various parts of the kingdom, only one or two of which have carried their object into effect. According to the projectors of these, there were then upwards of a thousand miles of railway already existing, but which were entirely devoted to private commercial purposes.

Public Clocks.— An additional melancholy proof, that the reign of public clocks is in its decline, is afforded by the new church of St. Dunstan in the West, whose front is quite destitute of a time-keeper, although not of an architectural ornament of like shape and size. This is an 'unkind cut' indeed, at the very church which was wont to be so celebrated for the chronometrical exploits of its wooden giants, of *striking* memory. It might be as well to abolish *them*, inasmuch as the chief service they rendered was to the pickpockets of Fleet Street, in attracting a gaping crowd, every quarter of an hour; but the clock itself might surely have been restored. To how many hundreds every day is the good old projecting clock of Bow Church of the utmost utility! A worthy magistrate, a few years back, was always very loth to commit a thief for stealing a watch, on the plea that such an article need not be worn in a place like London, where no one could ever walk five minutes together without seeing the time by a church clock. He would feel no compunction now!

Important to Omnibus Proprietors.—The "London and Paddington Steam Carriage Company," which was to have been in full play eight weeks ago, has *not* yet commenced operations on the City Road.

Architectural Museum.—Sir John Soane has testified that he was in earnest, when he proposed to make over his magnificent collection of antiquities to the public for ever, by applying to Parliament for an act to secure the carrying of his intention into effect. As soon as the bill passes, the property will vest in the public; but it is proposed that the collection will be only open for three months in the year—in our opinion, a very inexpedient restriction. The bill is opposed by the only son of Sir John (the dramatist): but it is expected this will not create much delay, and that matters will speedily be settled to the satisfaction of all parties concerned.

Railway Bills.—The London and Birmingham Railway Bill is making progress through the House of Commons, with the utmost speed the regulations with regard to private bills will allow; and it is anticipated that it will this time meet no obstacle to its passing in the Upper House, an understanding having been come to with the former opponents of the measure, or at least the more influential part of them. It is therefore fully expected that the engineers will commence operations very shortly on the line. Competition, however, must be looked for, where it might not have been expected: a stage-boat has been announced, to start for Birmingham, on Midsummer-day, which is to reach its destination in sixteen hours, with passengers as well as goods. If this speed can be maintained, the canal will prove a a formidable rival to the railroad. The London and Greenwich Railway Bill has also been brought in, and appears to meet with no opposition.

Hand-labour v. Machinery.—Among the recent additions to the already long list of Penny Periodicals, the one most deserving of notice is "The Advocate, or, Artizans' and Labourers' Friend," having for its object to show and to enforce (by plain arguments only) the means of turning the powers of machinery to the benefit, instead of the disadvantage, of the working classes. Unfortunately, this laudable object has been quite lost sight of, and the work is now chiefly filled with mere rhapsodies against the use of machinery altogether, and one-sided commentaries on some of its effects. This is a pity; for such a publication, soundly conducted, might be of considerable utility. 'The advocate' is very well printed, by *manual labour* only, although the paper has hitherto, it appears, been *necessarily* of that kind *manufactured by machinery!*

Opossum Gloves.—We have had the pleasure this week to see a pair of very soft and comfortable gloves, made of opossum fur, in Mr. Mackenzie's family at the Lower Clyde. They are softer than the finest Angola wool we have ever seen; and we trust they will be the means of bringing so useful and desirable a material of dress into general use both here and in England.—*Hobart Town Courier, Oct.* 12, 1832.

Iron Canal Boats.—The *Glasgow Chronicle* mentions the shipment for Liverpool of a new passage boat for one of the Lancashire canals, which has been built entirely of iron, by the same parties who constructed the Ardrossan Canal boats, and on the same plan. It is 76 feet in length, 6 broad, capable of accommodating 120 passengers, and weighs only 34 cwt., very little more than a common stage-coach.

Equality at Worship.—The most beautiful interior of a village church I have seen was that of one

rebuilt by a peer of high rank, now deceased, and one of the most excellent of men in every relation of life. It did not contain a single pew. The peer and the peasant each sat on the same sort of seat, an open bench with a desk affixed to the back, such as are still seen in many of our old churches. Pews are comparatively a modern introduction, and often greatly disfigure a beautiful church.—*Loudon's Encyclopedia of Cottage, Farm, and Villa Architecture.*

Steam-Carriages.—A steam-carriage is about to run between Norwich and Yarmouth. It has been built by Mr. Watts, engineer, Rose-lane, Norwich; trials have been made, and it is found to answer exceedingly well.—*Stamford Mercury.*

Not so True.—A grand steam-carriage of 100 horse power now runs between Birmingham and London. It carries 40 passengers; the wheels are 8 inches wide, and perfectly flat. The pace can be altered at the pleasure of the engineer from 1 mile to 50 an hour.—*Hobart Town Courier, Oct. 26, 1832.*

Perkins's New Boiler.—We quoted lately (p. 304) from a contemporary journal a statement respecting an experiment making on the Liverpool and Manchester Railway with a boiler constructed according to Mr. Perkins's last patent, in which it was stated that in 360 successive journeys there had been "a saving of fuel to the extent of 40 tons when compared with the ascertained consumption of another locomotive-engine drawing equal weight." But at a meeting of the Institution of Civil Engineers on the 26th of February last, "a member connected with the Liverpool Railway" (Mr. Stephenson, jun., we presume), stated that "the trials with Perkins's patent circulators had not been prosecuted far enough to justify a decided opinion as to their utility;" that "*no saving of fuel* had yet been effected through this means;" but that "it was expected the wear and tear of the boiler-plates would be considerably reduced."

Steam Tugs.—The advantage of steam-tugs in facilitating the departure and arrival of sailing-ships is beginning to be very generally appreciated. A member of the Civil Engineers' Institution stated at a recent meeting, that a coal-ship of which he is the owner is enabled by this means to make fifteen voyages annually; whereas the average number of trips used formerly to be only nine or ten. May not this help, in some measure, to account for that inactivity in our shipbuilding yards which is so much complained of? Two ships can now do the work of three.

Mile Houses.—A plan has been proposed to the Commissioners of Turnpike Roads to build small houses, with gardens adjoining, at every one or two miles, on all the high roads in the kingdom, to be let at moderate rents to industrious labourers of good character, but not to be licensed to sell beer. It is thought it would be attended with many advantages, in case of accidents, robbery, or any impediments; there would be a person always near to render assistance; he would be obliged to keep a few implements, rope, &c., in his house, and burn a light during the night. Such an arrangement would be a check upon gipsies and other depredators, and afford great facilities in the repairing of roads and removing obstructions, by the labourers being always near their work, instead of residing in distant villages. If any patriotic gentleman would build a house in a suitable and conspicuous situation, in order to keep the plan in view, he would merit the thanks of the community.—*Cheltenham Paper.*—We insert the preceding paragraph at the request of a correspondent, by whom it has been forwarded to us. It would have been no more than fair, however, in the Cheltenham journalist to have mentioned that the scheme (which we earnestly hope to see realised) originated with an intelligent correspondent of the Mechanics' Magazine, in which its merits have been at different times very fully discussed.

LIST OF NEW PATENTS GRANTED BETWEEN THE 22D OF FEBRUARY AND THE 22D OF MARCH, 1833.

Henry William Nunn, of Whippingham, Isle of Wight, bobbin-net lace manufacturer, George Mowbray, of the same place, and Richard Alabone, of Newport, Isle of Wight, foreman to the said Henry William Nunn, for certain improvements in the machinery used in the manufacture of bobbin-net lace, for producing certain kinds of embroidered or ornamented lace. To enrol within Six Months from 27th February.

John Thompson, of the London Iron and Steel Works, and No. 2, Parade, Thames-bank, near Chelsea, Esq., for certain improvements in the steam-engine. Six Months; Feb. 27.

Charles Jones, of Birmingham, gun-maker, for certain improvements upon percussion locks applicable to fire-arms. Six Months; March 7.

John Springall, of Oulton, iron-founder, for an improved corn-stack stand. Two Months; Mar. 7.

Thomas Don, of Lower James-street, Golden-square, Westminster, millwright and engineer, for certain improvements in machinery for the preparation of farinaceous substances, and on the processes of making bread; portions of which improvements were communicated to him by a foreigner residing abroad. Six Months; March 8.

William Hewson, of Worcester, lace-manufacturer, for certain improvements in machinery for manufacturing lace, commonly called bobbin-net lace. Six Months; March 14.

Miles Berry, of 66, Chancery-lane, mechanical draftsman, for an improvement or improvements in the making or constructing gas-meters; being a communication from a foreigner residing abroad. Six Months; March 19.

William Herbert, of Nottingham-park, county of Nottingham, lace-manufacturer, for certain improvements applicable to that class of machinery commonly called or known by the name of wark machinery, employed for the manufacture of lace and other fabrics. Six Months; March 21.

INTERIM NOTICES.

The Supplement to Vol. XVIII., now concluded, will be published on the 1st of May. It will contain a Portrait of Professor Babbage, engraved by permission from an original painting, with Preface, Title, and Index; price 6d.

Our esteemed correspondent, G. D. of Dereham, must have overlooked a former notice addressed to him, which contained a remedy for the difficulty mentioned at the end of his last communication (17th of February). We shall be glad to hear from him often.

W. H. K.—Forwarded.

C. W. His remarks on the patent laws are very just, and shall not be overlooked when we come to treat of the projected changes, which though in some respects very good, are in others extremely exceptionable.

Communications received from Mr. Stanley—J. E.—A Gas Maker—Lictor—Mr. Jopling—Mr. Murdoch.

ERRATA, p. 107.—For "pynameter" read, in every case where the word occurs, "pyrometer."

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END OF VOLUME XVIII.

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ERRATA IN VOLUME XVIII.

P. 121, col. 2, l. 15 from the bottom, for "and" read "or."
P. 158, col. 1, l. 1, for "cos. (A + B), sin. B," read "cos. (A + B), sin. (A + B)."
P. 207, col. 2, l. 18 from the bottom, for "novels. With" read "novels, with."
P. 255, col. 2, l. 1, after "Mr. N." insert "is."
——————— 1, after "he" insert "has."

☞ Other Errata will be found noticed in the course of the Volume under "Interim Notices."